AUGUST, 1958

TRAFFIC ENGINEERING

• The Highway Administrator Looks at Traffic Engineering

• Assignment of Passengers to Transit Systems

• Encouraging Group Insurance Participation

in Industrial Employee Parking

• How Can Counties Develop an Adequate Traffic

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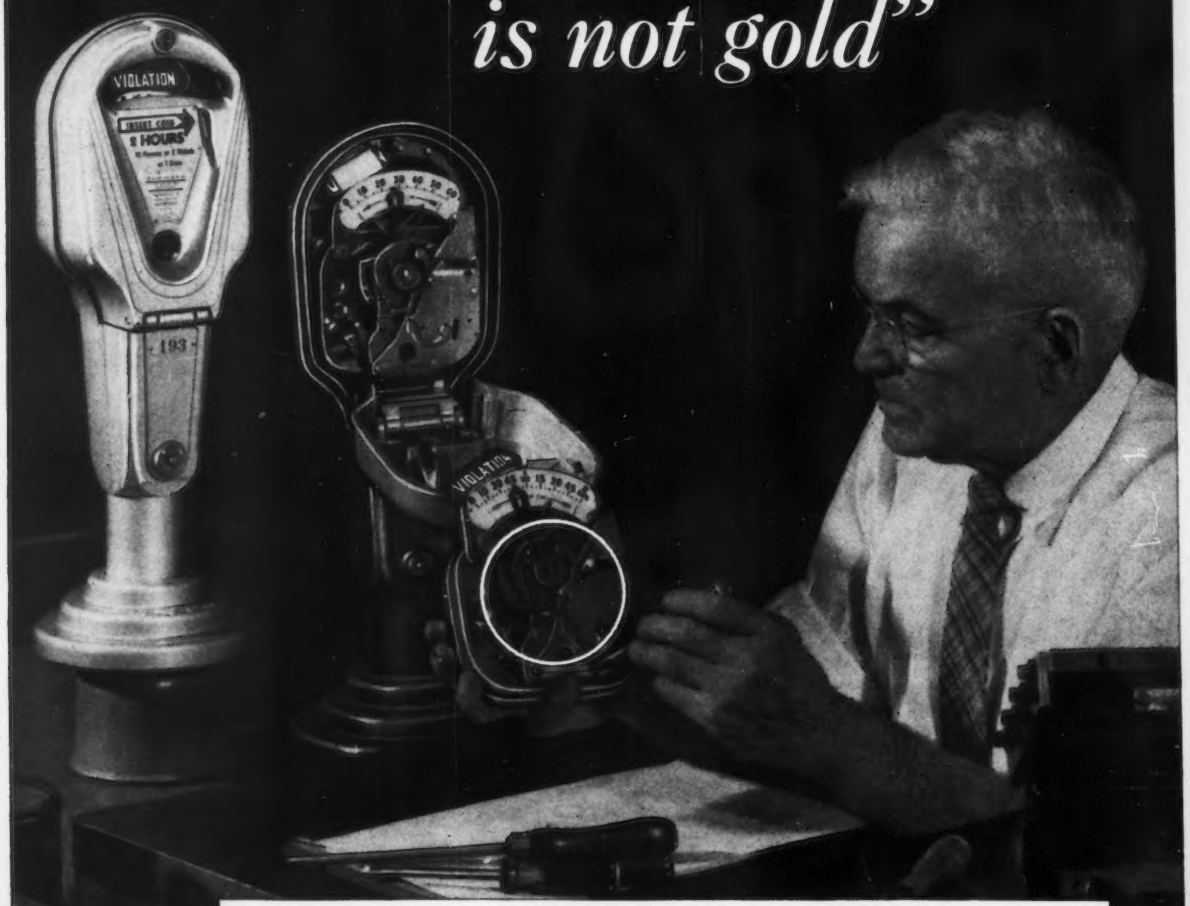

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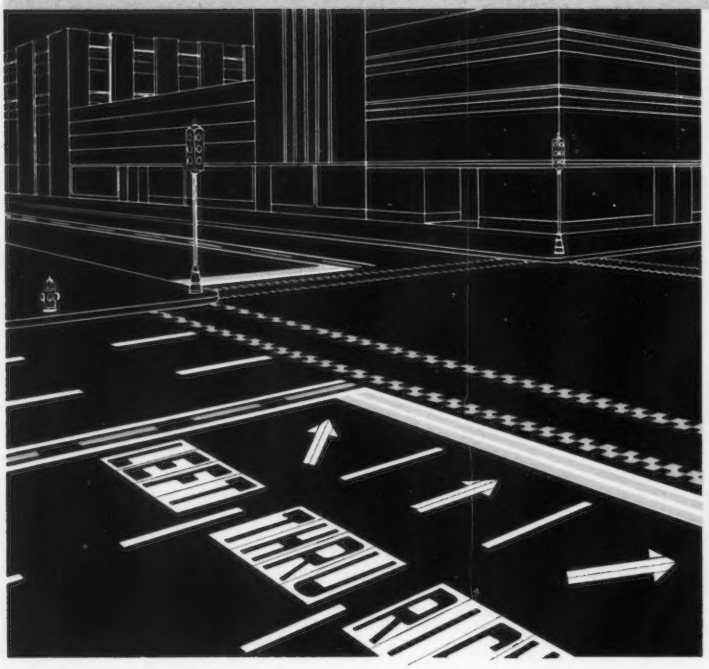

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Vol. 28 AUGUST, 1958 Number 11

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COVER: Spanish Harbor Bridge, Florida Keys.

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TRAFFIC ENGINEERING is published monthly by the Institute of Traffic Engineers. Editorial offices are at 2029 K Street NW, Washington 6, D.C. Advertising plates should be sent to Interstate Printing Corp., 400 Watchung Avenue, Plainfield, N. J. For advertising information other than California, address Traffic Engineering, 2029 K Street NW, Washington 6, D.C. For California information, address Jess M. Laughlin Co., 3757 Wilshire Blvd., Los Angeles 5, Calif.

Entered as second-class matter November 7, 1941, at the Post Office at Plainfield, New Jersey, under Act of March 3, 1879. ¶Single copies 40 cents, subscription price $3.50 per year in the United States and Canada; $4.75 per year to foreign countries.

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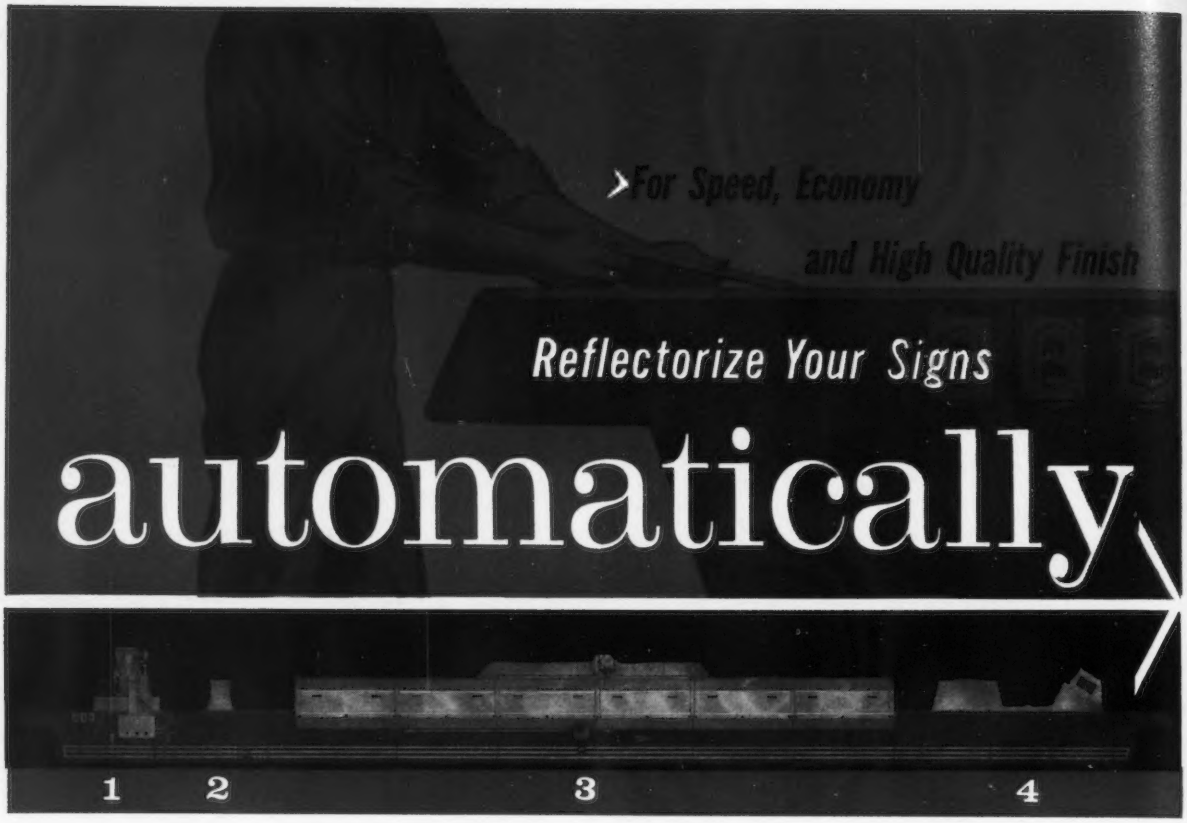

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Frankly Speaking . . .

TRAFFIC ENGINEERS will be increasingly called on to devote more time and energy to traffic planning. All too often, they are so occupied with urgent and nagging problems requiring traffic controls on existing facilities that little time remains for planning matters. The traffic engineer can make valuable contributions to traffic planning because his knowledge of traffic generation, routing and the operations of existing roads and terminals is fundamental to the establishment of needs, locations and geometric design criteria for new highway facilities.

Traffic engineers should not become so engrossed in *highway* planning that they overlook the impact of highways on land use and control. Overall planning attempts to develop the environment which produces traffic while highway planning attempts to create the facilities necessary to accommodate the traffic movement so produced. This difference in function has tended to create different criteria for the location and design of traffic facilities from the overall planning and highway planning points of view. These view points must be reconciled.

The greatest socio-economic problems are in urban areas where traffic concentrates and where land use and access are the key factors in the creation of prosperity and social progress. As a nation, we are aware of the importance of our urban centers and steps of great magnitude are being taken so these centers will continue to thrive and expand. The huge programs of expressway construction and urban renewal now underway, or contemplated, are indications of the urban transformations to come. These programs will cause revolutionary changes in the structure of our cities and should be developed jointly by traffic engineers and city planners for comprehensive and integrated planning of transportation facilities and urban growth.

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The Highway Administrator Looks at Traffic Engineering

By W. A. Bugge
Director of Highways
State of Washington

This paper by Mr. Bugge, former president of the American Association of State Highway Officials, was the opening address at the 1958 meeting of the Western Section of ITE in Sacramento, California on June 18. Because of illness, Mr. Bugge could not be present and the paper was read by Mr. H.C. Higgins.

I WANT TO POINT OUT in rather broad terms just what your traffic engineering profession means to the highway program. And I want to point out, too, just what you can do to make your proper contribution to its success.

Our society is dependent upon highway transportation. Without it, many communities would wither and die. Many persons would be without the necessities of life.

Thus, the job of building highways is an important one. And the traffic engineers play a vital part in providing good highway transportation to provide for a more abundant life for all of us.

Our economy moves over three-quarters of its total freight tonnage by trucks. Including the millions of men and women building automobiles, parts and tires, refining petroleum, servicing automobiles, trucks and buses, and building highways, one out of every seven workers earns his livelihood through highways.

Farm prosperity depends upon an adequate highway system. For more than half of all fruits and vegetables arrive at wholesale markets in cities by truck. Three out of every four shipments of livestock come by truck. All told, 90 per cent of farm products now reach their markets by highways.

You see highways are important.

They are necessary for our daily life. Their improvement is essential if we are to better the conditions under which all of us live.

What has happened to vehicle registration and use over the past few years that alerts us to the need for a vigorous traffic enginering program?

Motor vehicle production in the post-war years totaled 86 million vehicles, more than the 82 million produced in all the years before 1945.

The nation's motor vehicle population has nearly doubled since World War II. At the end of last year there were over 67-million cars, trucks and buses registered, compared with about 34½-million in 1941. The present percentage of families owning at least one car has increased from 51 per cent before World War II to 75 per cent last year.

Annual U.S. motor vehicle mileage has nearly doubled in the last 15 years.

So you see that we haven't been standing still. Our highways are being used more and more by our people.

Consequently, we are working on a great nation - wide highway - building task.

Highway personnel over the nation have been called upon to deliver the goods — on time and in excellent condition. And traffic engineers are a part of that team which will do the job.

The Institute of Traffic Engineers was founded only 28 years ago. The contributions made by its members in helping our nation take advantage of the many benefits the motor vehicle has to offer our society are immeasurable. Surely they have been a very effective force for improving traffic services by providing an organization around which men may gather as members of a profession dedicated to carrying out a job which society finds important.

That's why we're meeting here—to renew our faith in ourselves, to dedicate ourselves to keeping alert to new ideas, methods and techniques, to learn just what is required of the traffic engineer over the years ahead.

I need not remind you that we stand on the edge of a virtual revolution in highway transportation. Over the next several years we will see startling advances in the types of vehicles we use and in the devices used to control those vehicles on our highways. We shall see equally startling changes in the types of highways we build. Our world is changing.

No doubt all have read about these new experimental vehicles without wheels and about the new electronic devices used experimentally to guide present-day vehicles. Certainly the very thought of the development of these new vehicles and these electronic devices poses a great problem for the traffic engineer for though these are dreams, there are other changes which we face as a stark reality.

What can we do to help society provide for these vast changes we expect in vehicle and highway design.

That's the problem of the highway engineer, the planning engineer and the traffic engineer. We can expect surely that registration of vehicles and their use will continue to increase. We can expect our economy to become increasingly dependent upon highway transportation for the clothes we wear, the food we eat, the recreation facilities we use. We can expect the vehicle and its highway requirements to continue to change over the years ahead.

The future of the traffic engineer and of his profession rests on their contribution to progress in highway transportation. They have to be ready with new tools to face the future. The traffic engineer must broaden his skills, add depth to his knowledge, sharpen his techniques.

For that way he progresses. That way he assures himself that he is con-

tinuing to make active and worthwhile contributions to the highway program.

The traffic engineers have specialists in the field of route analysis, in the layout of ramps and interchanges, in the designing of channelization, in signing, lighting and in the many other phases of traffic engineering.

Your profession has done well. You have come far.

But I point out to you that we have farther to go before we're through with this highway program.

For instance: We have an urban traffic problem in this nation which very likely transcends in importance any of the others facing our people. The aim of our cooperative state and federal program is to eliminate congestion in these urban areas so far as possible, to speed movement into and out of the hearts of cities, to save lives and property now needlessly lost.

Here in these cities the traffic engineer meets his greatest challenge. For among other things he will be working with city planning agencies with a long history of traffic planning in city areas and he will be working in an atmosphere which can become rather cloudy with differences of opinion. The traffic engineer can make his greatest contribution by developing his plan soundly, discussing it thoroughly, selling it assiduously and operating it efficiently.

But there are other areas in which the traffic engineer must work. He must plan for the future which promises new and more advanced vehicles with new and revolutionary highway needs.

The traffic engineer's skills, his knowledge and techniques are required in this great program — there isn't any question about that.

The traffic engineering profession, by insisting upon high standards for its members, has gained wide acceptance among the people of the country. Their services are in demand from all agencies of government and from private business groups concerned with traffic problems.

Never before have we been more in need of intelligence, resourcefulness and ingenuity in our approach to traffic problems than we are right now. But the traffic engineer should be the first one to acknowledge that his present skills, knowledge and techniques are not enough to meet the requirements of this new highway building age.

So, let me point out to you that this is another one of the issues facing the traffic engineers.

To provide for the future, the traffic engineer can't confide his thinking to hidebound texts. It will be necessary to go beyond the rules set down in the traffic engineer's handbook. He will have to be original in his thinking.

That certainly doesn't imply thinking up hare-brained schemes. Rather, the new concepts should consider the needs of the future, they should be based upon sound engineering practices. They should be well thought out and tested.

That implies an intensive research program. For only through a research program can you test your ideas and from the tests—either adopt, discard or modify the ideas.

Research doesn't involve the mere gathering of statistics. Research is science, and if I might quote Webster again — this time on science: "A branch of study concerned with observation and classification of facts, especially with the establishment of verifiable general laws, chiefly by induction and hypothesis."

Break that down and we find that scientific research includes observation of facts to discover something not yet known. And I think it is pretty generally agreed that there's a whole lot that we don't know about motor vehicle transportation and the relationship of the driver, the vehicle and the highway to one another.

Thus, there is no question of the need for research into the unknown.

Lawrence R. Hafsted, Vice-President for Research for the General Motors Corporation, defined research this way, "Research is not constructing and manipulating; it is not observing and accumulating data; it is not investigating or experimenting; it is not getting the facts—although each of these activities may play an indispensable part in it. *Research is the effort of the mind to comprehend relationships which no one has previously known.*"

What Dr. Hafsted is saying is this, "It's a perfect waste of time to gather a bunch of figures and glance fleetingly over them and then to set them in a vault and forget them."

His definition implies the need for a keen, analytical mind to study these data, assemble them in orderly fashion, study them thoroughly and to report on just what they mean.

To discover something new is the aim.

I'll wager that in many of our offices are boxes full of statistics—dry, meaningless, dead—unless we have a mind anxious to explore, anxious to discover something, straining to find out something new.

Surely the traffic engineering profession, if it is to look forward to the new age of highway transportation, is going to have to be research-minded. There's no other way to solve these incredibly complex problems we see coming over the horizon.

The research of the traffic engineers should be directed at discovering the minute components that comprise the whole body of highway transportation. He must then seek ways to control those components so that they will result in productive instruments of safety and efficiency for the growth of our dynamic society.

Then we have to face this.

One of the facts of the age in which we live is that we in the highway field don't operate in a vacuum. We operate with the public's eye on us. People look over our shoulders and most try to second guess us.

I've heard it said several times that we make a mistake in these meetings. We gather here in conventions and we tell each other what we're doing and what we'd like to do. We announce to one another what our problems are and how we'd like to overcome those problems. We often pat each other on the back and tell each other we've done a good job.

I've heard people ask, "Why do you talk those things over among yourselves? Why don't you tell it to the people who should know about traffic engineering and the things the traffic engineers do to make highway transportation safer and more efficient?"

They have a point. It is a waste of time for us to work in virtual isolation, in a little world all our own, to dream great dreams—if we are out of touch with the public we serve.

The very nature of the traffic engineering profession calls for working with the public, for almost everything the traffic engineer proposes involves people and their interest.

We have to sell the public on what we're doing if we expect any use to be made of our services.

This is an inescapable fact.

Unless we can sell the public what we're doing, we're just wasting our time. For people won't buy it unless we can make them want it.

It has been said that "public relations is the key we use to open the minds and hearts of men."

Certainly we have to open the minds of men and women toward the new concepts of traffic engineering. If we propose a channelization program, we have to sell it. If we propose a new system of traffic regulation, we have to sell it. That follows for everything the traffic engineer does or proposes to do.

Accept this plain truth — we can't accomplish anything without public-cooperation and support.

So we have to be public-relations minded in the things we do. It is foolish to deny the fact that we're coming to need an approach to problems which call for full public cooperation. We can't ignore the realities of life.

The simple objective of a public relations program is to win friends and influence people and if a fellow ever needed a friend it's the traffic engineer, for everything he does affects the public in varying degrees.

Certainly this isn't true only for the traffic engineers. For every one of us in the engineering agencies of the nation must learn this lesson and relearn it.

No longer can we go about our work considering the job of earning good will as the responsibility of only one or two people. We have learned sometimes through bitter experience that our best public relations efforts at the top are wasted if we have in the lower echelons a hard core of employees who are determined that their views prevail and who espouse that "public be damned" attitude.

Over the past few years, I've seen this attitude change. This public relations approach has been accepted. Now most are working hard at the job of earning public good will. I can find nothing more wholesome developing over these past few years than this feeling that we have to consider the public's wishes, its desires, its hopes and its aspirations.

This attitude is going to make our jobs a whole lot easier. And anything that can make our jobs easier will be a net gain to the highway program.

Over the next several years we're going to need a lot of this public understanding. For we're going to be building the world's greatest network of highways. Too, as we carry out this program, the traffic engineer must integrate his work with other divisions of the street or highway departments so that his unique talents may be utilized to the fullest. The vast experience of members of this branch of engineering certainly make that imperative.

These new highways we're building will require designs incorporating the lessons learned and proved practicable by the traffic engineer. The limited access plans must be designed to provide the greatest safety and convenience to traffic and at the same time provide sufficient service to abutting land. Our new interchanges must be designed with a view to making it possible to utilize fully these new freeways. For it goes without saying that if the interchanges and their ramps and approach roads aren't sufficient, our freeways just aren't going to serve their intended purpose.

Too, these freeways must be signed so that the fast traffic we expect can be guided safely to its destination.

And so it goes throughout the vast areas in which the traffic engineer works.

But we must remember that it isn't only on the new highways that the traffic engineer's talents will be needed. There will remain many hundreds of thousands of miles of highway which aren't going to be rebuilt. Many of our city streets and county roads and state highways will continue to carry increasing loads of traffic.

It is essential to good highway transportation that the traffic engineer use his tools and techniques for preserving these roads. We know that the limits of the usefulness of these highway sections haven't been reached. They can be rehabilitated by the traffic engineers if they have the will and the desire and the aggressiveness to get the job done.

We know, too, that the public isn't going to spend a lot of money in this rehabilitation program. So the tools must involve a rearrangement of the traffic pattern. Many cities have done remarkably well in obtaining a higher degree of usefulness from many thousands of miles of what had been congested streets and these practical demonstrations can serve as a model.

The traffic engineer must be alert to this need. He must go out actively and uncover these problems. He can't stay in his office and ponder about them—he has to get out in the field and work out the solutions.

And over the years to come, it is probably in this field that the traffic engineer is going to make his greatest contribution to the improvement of the highway transportation system. For it is relatively easy to build a new highway and incorporate in the plans all the latest wrinkles. But it is infinitely more difficult to rehabilitate roads and streets which are overloaded with traffic.

It is essential that we accomplish this difficult job.

It certainly is one of the issues facing the traffic engineer.

Could there be anything better in life than looking forward to these challenges and these great opportunities? It there anything more satisfying than having a difficult job staring us in the face? These are the issues.

The traffic engineer must be alert for changes in traffic conditions. He has to study, observe, analyze and report on what is happening to the vehicle, the driver and to the highway and the relationship between the three. He has to be research-minded.

Revolutionary changes are coming and he has to be ready for them.

He can't live in the past. He can't employ today the solutions for yesterday's traffic problems. He had better start working on plans to develop the solution to tomorrow's traffic problems. Practical solutions to the new and exciting possibilities posed by new vehicles and new highways must be found.

The traffic engineer must be public-relations minded. He must be able to sell his product to the public. Without public support and without public knowledge of what he does, the traffic engineer doesn't get his message across and he doesn't get his product sold.

He has a real job to do in working with other engineering and planning divisions to get these new roads built.

But beyond that, he has a job of rehabilitating hundreds of thousands of miles of city streets, county roads and state highways which will not be rebuilt.

These are the issues.

This is your opportunity for contributing to the welfare of this nation.

But before I close, let me take the liberty of doing a little second-guessing on the highway engineering program.

(Continued on page 36)

Assignment of Passengers to Transit Systems

By
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TRAFFIC ASSIGNMENT is a term applied to the method of calculating the number of vehicles or persons that would use a given transportation facility under certain given travel conditions. It is used to evaluate the potential traffic on a facility or compare the locational values of any number of hypothetical facilities.

In 1955 the Metropolitan Toronto Planning Board was authorized to report on the future rapid transit requirements of the Metropolitan Area. To analyze and compare the alignment, usage and efficiency of a number of hypothetical tranist systems, a mechanical transit assignment method was developed for use in conjunction with an origin-destination survey of transit trips.

The nature of the study required that two problems had to be solved:

a. Selection of the best transit route with or without the use of a rapid transit line. This selection was required for each individual trip or group of trips having a common trip origin and destination.
b. Assignment of passengers to the selected route and calculation of passenger volumes at entry and exit stations and between stations of the rapid transit system tested.

Origin-Destination Data Used In The Assignment Procedure

The trip origin and destination data of transit passengers provided the following information:

a. Direction of travel:
b. Route of transit trip:
   The station of origin
   The first point of transfer (if any)
   The intermediate routes used (if any)
   The final route
   The destination station on the final route
c. Time period during which trip took place:
   1– 6:00 a.m. to 9:00 a.m. —rush
   2– 9:01 a.m. to 12:00 noon —normal
   3–12:01 p.m. to 4:00 p.m. —normal
   4– 4:01 p.m. to 7:00 p.m. —rush
   5– 7:01 p.m. to 12:00 m. —normal
d. Purpose of trip.

Preparation of Input Data

To reduce theamount of computational work involved, the 49,424 O-D trip cards were summarized to 29,000 O-D cards by adding all trips with identical components of route, time period and purpose. The use of transit zones, referred to below, permitted a further reduction of data to 3,953 transit zone cards.

The transit route stations and zone centroids were assigned coordinates by means of a 1/10 mile grid superimposed upon a map of the area. The x-axis of this system was taken parallel to the direction of the main east-west streets.

Because an assignment between the 1200 O-D route stations recorded by the survey would considerably extend the computer time and increase study expenditure, the area was subdivided into 94 transit zones. The size and shape of each zone was primarily dependent on the location of the transit routes although trip density and geographical configuration were also taken into consideration. Thus the central area zones were much smaller than those of the suburbs.

For each of these transit zones a "centre of gravity" was computed on the basis of the number of trips at each route station within the transit zone. A set of 94 grid points or centroids was thus obtained. For the assignment study the 29,000 O-D trip cards were summarized to 3,953 cards to conform to the 94 O-D centroids.

The distance between any origin and destination of a trip is equal to the sum of the absolute differences of their coordinate values. This sum is referred to as the *rectangular distance.* In areas with a rectangular road layout and surface transit facilities following this pattern, it is reasonable to assume that the rectangular distance is equal to the distance travelled on surface transit facilities.

In some cases, the rectangular distance deviated from the actual travel distance considerably. This is the case where obstructions, natural or man-made, force travellers to use routes not conforming with the "rectangular" pattern. A minor program was developed to find the nearest bridge crossing the obstruction and the rectangular distance was adjusted accordingly.

The grouping of trips from and to a relatively wide area into trips from and to fixed points (centroids) naturally introduces a distortion in the prediction since, by insisting that all passengers initiate and terminate their trips at pre-assigned points, some passengers are required to deviate appreciably from their actual origin and destination stations.

A test of the distortion introduced by zoning was made by comparing the number of passengers travelling between their actual origin and destination route stations, as indicated by the O-D transit survey and those consid-

This paper is condensed from a fuller report available from G. A. Bacchus, Assistant Traffic Engineer, Metropolitan Toronto Planning Board, 133 Richmond St. West, Toronto 1, Ontario.

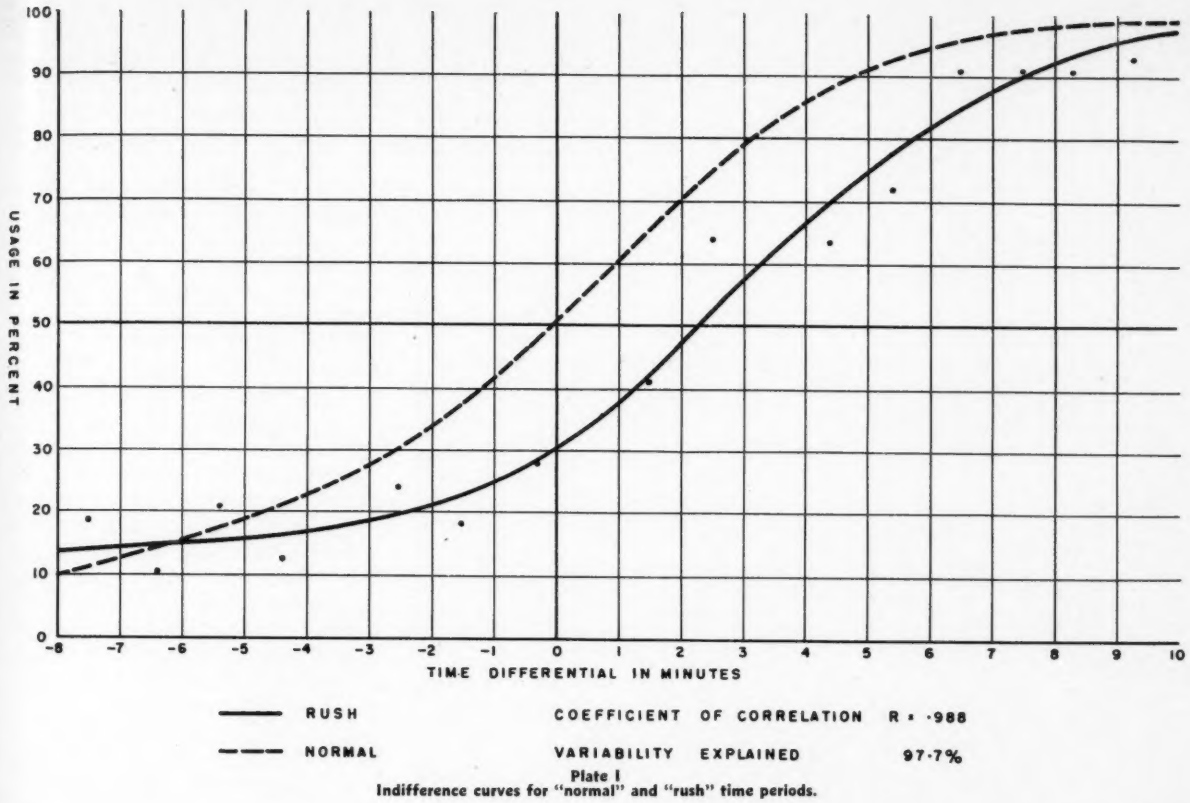

Plate I
Indifference curves for "normal" and "rush" time periods.

ered as travelling between O-D centroids.

The predictions obtained from the two methods exhibit a maximum deviation of less than 8 per cent. Also the deviation is not in the same direction for all zones, so that the total average deviation of the results given by both methods is less than 2.5 per cent.

The Principles of Selection of The Most Useful Route

Each hypothetical rapid transit system was analysed to find the number of possible alternative routes. In general, the number of possible alternative routes was determined by the number of intersections in the system. Thus, for a rectangular rapid transit system consisting of two lines intersecting at a point, there were four possible alternative routes of going from any origin to any destination:

For a rapid transit system consisting of three lines intersecting a fourth line, there would be sixteen alternative routes. The program developed handled rapid transit systems with approximately six intersections or ninety alternative routes.

Each of the alternative routes represented an array of stations numbered consecutively throughout the rapid transit system. Thus, each station was identified by a number and by its coordinates relative to the grid system. These stations and alternative routes were incorporated in the program as a table.

The travel distance from any origin to any destination consisted of:

1. *Access distance*—travel distance to the station nearest the origin plus travel distance from the exit station to the destination.
2. *Rapid transit distance*—travel on the rapid transit system from entry station to the exit station nearest to the destination.

In order to allow for the difference in speed of travel between travel on rapid transit and travel on surface routes, the rapid transit distance was converted into an equivalent surface distance.

This conversion involves multiplying the rapid transit distance by the appropriate speed ratio. This speed ratio is equal to the speed of the surface transit facilities divided by the speed of the rapid transit system. It is possible to apply various speed ratios depending on the particular part of the rapid transit system being considered.

To determine travel times for each alternative transit route tested by the computer the rapid transit system was given a speed of 17.64 m.p.h. which is the present average operating speed of the Yonge subway. For surface travel a speed of 9.64 m.p.h. was used for rush periods and 10.57 m.p.h. for off-rush periods.

Data for headways and operational speeds were obtained from the service schedule of the Toronto Transit Commission. Headways were used depending upon the type of the transit facility to which a transfer is made and the time period of the day.

Under the following special conditions headways were not used:

1. If there was the possibility for a traveller to use trains not requiring a transfer.
2. If the origin or destination coincided with the rapid transit station.
3. If the access distance was a walking distance of less than 0.2 mile.

After computing the time and distance travel on the alternative routes available using rapid transit for all or part of the trip, the best route was compared with the time and distance of travel exclusively by surface transit.

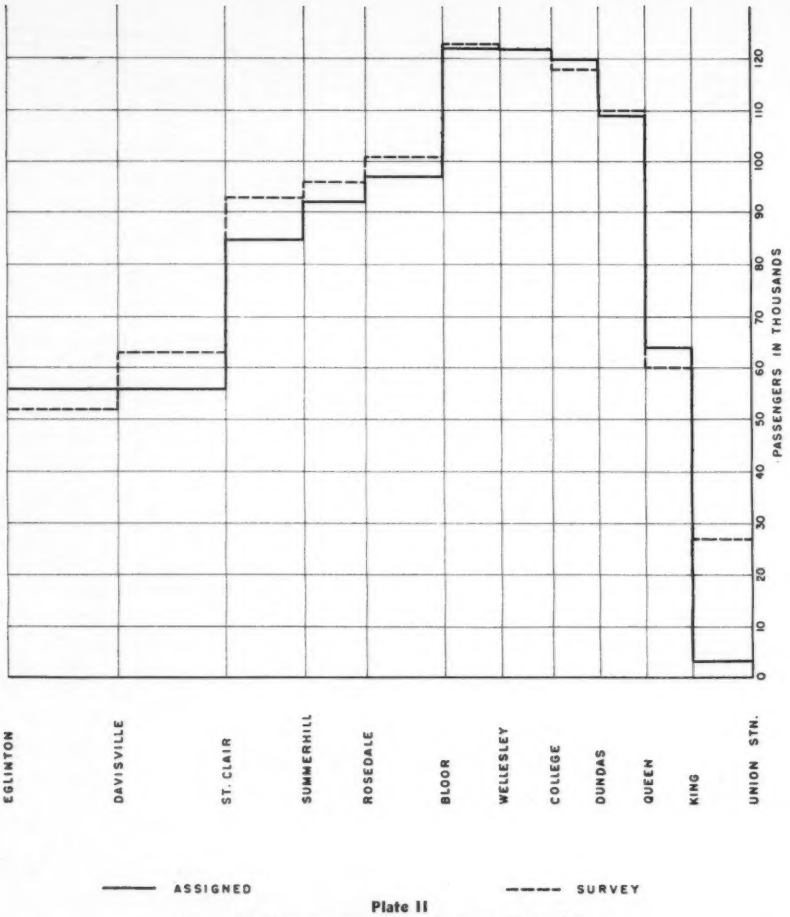

Plate II
Assigned and survey passenger volumes on Yonge Subway.

The time and distance difference between these two routes was calculated and was used to assign passengers in the second part of the program.

Development of the Transit Assignment Curves

After calculating the trip time and distance of travel on a number of alternative transit routes between origin and destination pairs, the program provides the time lost or saved and the distance lost or saved between the surface route and the best route using rapid transit for all or part of the trip.

However, in practice not all transit passengers having identical trip origins and destinations use the route calculated to be the most efficient. The rational distribution of passengers between the routes available between each O-D pair is known to depend on a number of variables of which time and distance are the most significant.

To determine the number of passengers who would use a rapid transit route in preference to a surface route a study was made of passengers using the Yonge Street subway to determine their time and distance benefits compared to travel by the surface route. Survey data used consisted of:

1. The trip origin and destination of transit passengers using the Yonge subway.
2. The number of passengers travelling between each O-D pair and using the Yonge subway.
3. The total interchange of transit trips between these O-D pairs irrespective of transit routes used.

Using these data in conjunction with transit operating speeds and headways, time and distance differentials were calculated for each O-D pair. These values were determined by comparing the travel time and distance of the surface route with the best route using the Yonge subway. Using the total passenger interchange between each O-D pair and the number of passengers shown to use the Yonge subway, users were expressed as a percentage of the total interchange between each origin and destination transit zone. To assess the significance of the influence of differences in transit time and distance on the proportion of passengers using the subway two relationships were investigated.

1. Travel distance differential of the subway versus the percentage of subway passengers.
2. Travel time differential of the subway versus the percentage of subway transit passengers.

Results of the first study indicated that time is more significant than distance.

Plate I shows the results of the time differential analysis for transit passengers travelling during "normal" and "rush" traffic conditions.

The coefficient of correlation of the "normal" curve of best fit was calculated to be $r = 0.996$. Thus 99.3 per cent of the variability could be explained by the influence of the travel time differential.

The scatter diagram for the "rush" period exhibits higher error limits than previously obtained for the "normal" time. It is evident that "rush" conditions influence per cent usage of the subway for the entire length of the curve. The coefficient of correlation for the "rush" curve of best fit was calculated as $r = 0.988$. Thus 97.7 per cent of the variability for this period could be explained by the influence of time differential.

Before the assignment curves were developed the estimated rapid transit passengers on a hypothetical transit system was obtained by assuming that 100 per cent of all passengers not losing time would use rapid transit. To determine the difference between the old and new method the passengers not losing time were totalled and compared with the totals obtained by using the assignment curve which includes a percentage of passengers both saving and losing time. Of the rapid transit systems tested the assignment formula produced increases on the average of 8 per cent and thus a more realistic passenger flow.

The Proof of Principles Developed

It should be expected that the application of principles developed above to a prediction of the passenger volume of the existing Yonge subway would produce, within certain error limits, the existing passenger volume on the line. This was done in order to prove the validity of the principles. The greatest discrepancy between predicted volume and existing volume oc-

(Continued on page 50)

Encouraging Group Riding by Preferential Treatment in Industrial Employee Parking Areas

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THE PROBLEM of insufficient employee and customer parking space to accommodate normal demand is a recurring one with all types of enterprises; Government, industrial, and business. In conducting a survey to determine the feasibility and usefulness of another exit to the 1,000-car-capacity West Lot of Building T-7, at Washington National Airport, Washington, D.C., a unique opportunity was presented to obtain data relative to the building occupants' transportation characteristics. Accordingly certain questions were included in the survey to determine (a) the origin, travel time, and mode of transportation being used, (b) the number and size of pool or group arrangements, and (c) the demand for additional individual permits.

Building T-7 is located in Arlington County, Virginia, in the northwest section of the National Airport complex. Within the building approximately 4,200 people are employed, primarily by various Department of the Army Technical Services, including such administrative groups as Cafeteria, General Services, etc., usually associated with a building of this type. The entire building is a security area. National Airport is the only other nearby major employment center.

Building T-7 is adjacent to Mount Vernon Memorial Boulevard, as shown in the area map (Figure 1). The Boulevard is a four-lane controlled-access highway connecting Alexandria with the Potomac River bridges to Washington. Access between Mount Vernon Memorial Boulevard and the Building Parking Lots is readily available to and from the north and from the south. However, traffic from the parking lots desiring to go south on the Boulevard is forced to travel through the Airport complex to a signalized intersection on the Boulevard at the south end of the Airport.

Figure 1

Access to the area is also possible through a local road, Hofenmaier Road, extending from the Airport along the back of Building T-7 and under the Boulevard to Route U.S. 1. The capacity of this road is limited by two "one-lane" underpasses under the R.F. & P. R.R. between the Boulevard and Route U.S. 1 and by the signalized intersection with Route U.S. 1.

There are two parking areas at Building T-7, one of which actually consists of two separate parking lots, as shown in Figure 2. The area consisting

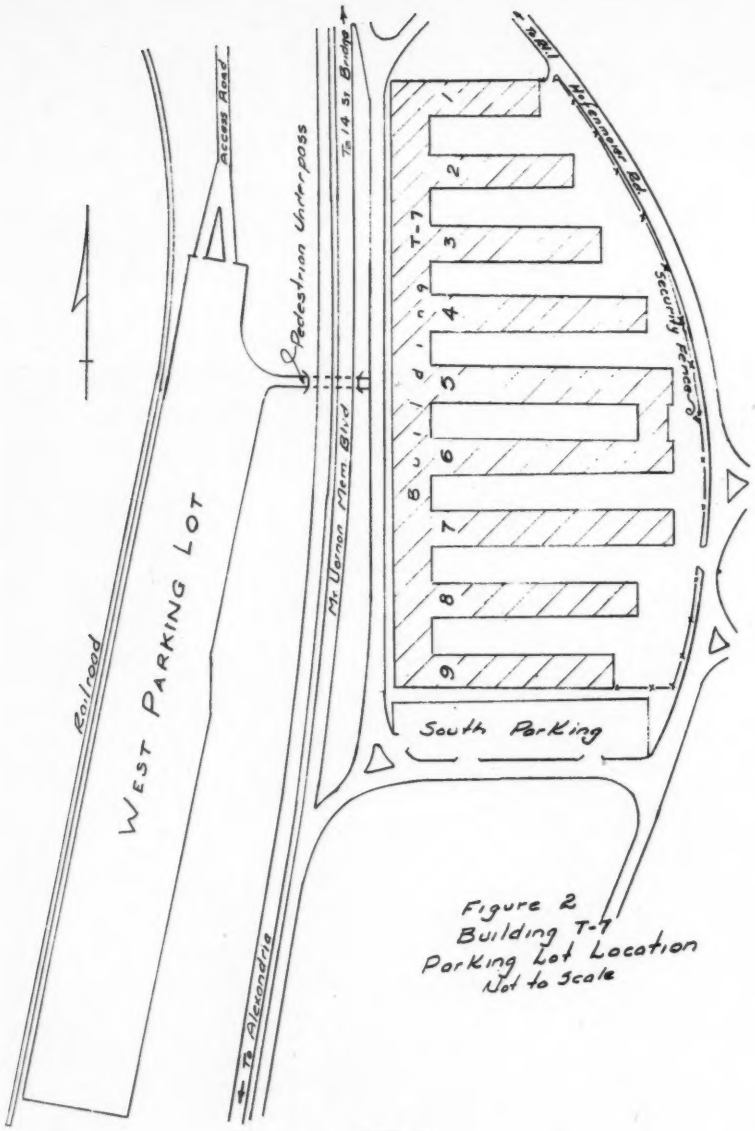

Figure 2

of two lots, locally known as the Compound and the South Lot, is immediately adjacent to the building. The second parking area, known as the West Lot, which has nearly twice the capacity of the first area, is located across the Boulevard from the building.

The Compound is within the fenced-in security area, and the parking spaces are along the wings of the building and along the fence to the rear of the building. Egress from the building to the lot is by stairways, of which there are generally two within each lane. A total of 563 parking spaces are available in the Compound area, including 15 spaces reserved for visitors. The South Lot is located at the south end of the building, outside the security fence, and is the only parking lot in which the parking stalls are not outlined. The lot is narrow and accordingly angle parking is permitted in portions of it. Due to the lack of delineation for the parking stalls, the lot capacity of 110 vehicles can only be estimated, as on occasions as many as 120 vehicles have been observed, due to encroachment on travel aisles. Entrance to the building can be accomplished at the front of the building, or at the rear by walking through the gates.

The West Lot is rectangular in shape and has a maximum of six rows of 90° parking arranged with two double and two single rows of parking spaces. Its capacity is approximately 1,000 vehicles. The circulation aisles are 26 feet in width. The lot is surrounded by a security fence, is paved, and has two gates opening onto the access road at the north end. This access road is a short, two-lane road connecting directly with Hofenmaier Road, which in turn connects with Mount Vernon Boulevard and Route U.S. 1. Pedestrian access to the center wing of the building from the north end of the parking lot is provided by an underpass.

In July 1953, an investigation was made of the usage of the parking areas by means of a one-day study. Cards were placed on the vehicles in the lots, and a return of slightly over 50 per cent was achieved. From this survey it was determined that the average vehicle occupancy in the South Lot and Compound was 2.92 persons per vehicle and in the West Lot, 2.45 persons per vehicle. Although the 1953 building population was approximately the same as the 1956, no shortage of parking spaces existed. The West Lot had recently been opened and the spaces formerly reserved for Building T-7 occupants in the commercial lot at the Airport had been released.

The private automobile is by far the most common method of transportation to the Building T-7 area. The only bus transportation available to this area, except for military shuttle buses, is from downtown Alexandria and Washington. The D. C. Transit Company does not operate in Virginia, and it is necessary to transfer to the AB&W Line at 12th and Pennsylvania Avenue in Washington when going from Washington to the Building T-7 area by bus.

Various methods were considered to determine the present transportation characteristics of the employees in the building. Local conditions made desirable the use of questionnaires distributed through the Office of the Building Commandant and the Administrative Services of the various agencies in the building. This permitted the distribution of the questionnaires through normal channels to all individuals and permitted a check on the number of questionnaires returned by a particular group. A sample questionnaire is shown in Figure 3.

In addition to the data on questions directly concerning parking, data were obtained relative to the present use of the various access routes and the probable use of an access road lead-

TRANSPORTATION SURVEY QUESTIONNAIRE

A. EMPLOYMENT GROUP: AFFIE COFFIN CCLMO COFENGRS GSI (Circle One) MDW COFORD ASESS CSIGO MTMA OCOFT OTHER (list name) .....

B. HOME ADDRESS: .....
(Include street, number, and town)

C. TIME TO TRAVEL TO WORK (in minutes): 10 15 20 25 30 35 40 50 60

D. USUAL MEANS OF TRANSPORTATION TO BLDG. T-7 AREA: (Circle One) WALK BUS CAR OTHER (.....)
specify

E. DO YOU HAVE A PARKING TICKET OF *YOUR OWN* (check one):
For Compound (blue ticket) .....☐
For South Area (red ticket) .....☐
For West Lot (yellow or white "B" ticket) .....☐
No ticket .....☐

F. WOULD YOU PARK YOUR CAR IN A BLDG. T-7 PARKING AREA IF A PARKING SPACE WAS AVAILABLE (check one):
Yes .....☐
No .....☐
Parking in T-7 Lot now.....☐

G. IF USUAL MEANS OF TRANSPORTATION IS BY CAR:

1. Approximate arrival time in T-7 Parking Lot (circle one): before 0730 0730 0735 0740 0745 0750 0755 0800 0805 0810 0815 0820 0825 0830 after 0830
2. Car not parked in Bldg. T-7 Parking Lots .....☐
   Car parked in Compound (blue ticket) .....☐
   Car parked in South Area (red ticket) .....☐
   Car parked in West Lot (yellow or white "B" ticket) .....☐
3. a. Drive alone 0 1 2 3 4 5 days per week (circle one)
   b. Participation in a cost-sharing or car pool arrangement: 0 1 2 3 4 5 days per week (circle one)
   c. Total number of persons, including yourself, in this cost-sharing or car pool arrangement is: 2 3 4 5 6 persons (circle one).
4. Access route to Bldg. T-7 Parking Area in Morning: (check one)
   (a) From Route 1 (Jefferson Davis Highway) via railroad underpass on Hofenmaier Road (15th Street) .....☐
   (b) Mt. Vernon Blvd. northbound from direction of Alexandria ☐
   (c) Mt. Vernon Blvd. southbound from direction of 14 St. bridge ☐
5. Which route would you prefer to use leaving the T-7 area after work: (check one)
   (a) Hofenmaier Road (15th Street) via railroad underpass....☐
   (b) Mt. Vernon Blvd. southbound toward Alexandria .....☐
   (c) Mt. Vernon Blvd. northbound toward 14th Street bridge..☐

This questionnaire will be analyzed by traffic engineers to determine whether adequate access and sufficient parking spaces are available for Bldg. T-T personnel and if not, what improvements may be justified.

It is requested that all personnel in Bldg. T-7 answer the applicable questions, regardless of means of transportation used, in order that a complete transportation survey can be made. Those who are not passengers or drivers of cars are not required to answer Question "G."

Figure 3

ing from the south end of the West Lot to Mount Vernon Boulevard southbound. Requirements exist for such an exit in the event of any emergency requiring evacuation of the building.

The use of any of the parking areas by an individual is dependent on the possession of a parking permit. Therefore every effort was made to avoid any connection between the questionnaire and the issuance of parking permits. Accordingly no names were requested on the questionnaire; however, in many instances names and comments were volunteered.

Another problem was to insure accurate data on car pools which do not function 5 days a week. Due to the nature of the general Washington area, many persons attend schools evenings and have outside activities, etc., which preclude their participating in a car pool every day. These pools were denoted as "split pools" and data were collected by having the persons answering indicate the number of days "drive alone" and number of days in a car pool or group per 5-day week.

Due to the nature of the organizations occupying the building, personnel are often away from the area on temporary duty. In some cases a more or less regular schedule of temporary duty is maintained, resulting in an irregular demand for parking spaces.

The basis of analyzing any data is to tabulate the data in a usable form. In this instance an unusual basic unit of time was used. Rather than using the normal basic unit of one day, all the information was collected, tabulated, and analyzed on the basis of a 5-day week. This was later transposed to an average daily demand. In this manner, all the unusual cases cited above could be properly weighed in relation to the normal riding arrangements.

Two questions were included which related directly to the access-road problems. One concerned the present route used in the morning. The second question dealt with the route desired when leaving the area after work.

Persons using buses to reach the area were instructed to answer only the first half of the questionnaire, questions A through F. Those using automobiles were requested to reply to all the questions on the form.

It was not definitely known whether a tabulating machine could be utilized for tabulating the data at the time of the development of the questionnaire. Accordingly the questionnaire was designed in such a manner as to simplify a hand tabulation. However, after each questionnaire had been checked for conflicting answers and coded, the data were tabulated entirely by machine. The only unusual feature in the tabulation involved the "split pools" and short workweek.

To properly account for the transportation arrangements which did not

TABLE 1

Area	Spaces Available	Space Demand	No. Permits Issued
Compound	548*	501	653
South	110±	125	121
West	1013	1452	2987
Total	1671	2078	3761

*Compound data do not include 15 spaces reserved for visitors.

TABLE 2
PARKING LOT USAGE

	Drive Alone	2-Person Pool	3-Person Pool	4-Person Pool	5-Person Pool	6-Person Pool	Total
COMPOUND (Capacity 548)							
Spaces per week	1045	318	207	178	180	62	2110
Spaces per day	209	64	41	36	36	12	398
Factored Spaces/day	263	80	51	46	46	15	501
Per Cent	52.5	16.1	10.2	9.2	9.2	3.0	100
SOUTH (Capacity 110±)							
Spaces per week	255	85	54	43	45	8	490
Spaces per day	51	17	11	9	9	2	99
Factored Spaces/day	64	21	14	12	12	2	125
Per Cent	51.2	16.8	11.2	9.6	9.6	1.6	100
WEST (Capacity 1013)							
Spaces per week	4147	843	354	215	150	62	5781
Spaces per day	829	171	71	43	30	12	1156
Factored Spaces/day	1042	215	90	53	37	15	1452
Per Cent	71.8	14.8	6.2	3.7	2.5	1.0	100
TOTAL							
Factored Spaces/day	1369	316	155	111	95	32	2078
Per Cent	65.9	15.2	7.5	5.3	4.6	1.5	100

operate for the entire workweek, the individual replies were sorted by number of persons in the vehicle (drive alone, two occupants, etc.). Each group was tabulated separately, and the number of days the arrangement operated was totaled and divided by the persons in the arrangement to obtain the number of parking spaces required per week. This was then divided by five to determine the average space demand per day.

The data were tabulated by employee groups as there were variances in the methods of issuing parking permits in the various agencies. Working hours are staggered and the number of employees in each agency varies from less than 100 to approximately 2,000.

Without the prior knowledge of the originators, the questionnaires were distributed shortly before Christmas. Due primarily to this fact, a return of only approximately 85 per cent was achieved, in spite of the "captive audience." Therefore all the tabulated data have been factored to reflect the entire building population.

Approximately 573 or 13.6 per cent of the building occupants use mass transit even though at least one transfer is required from any residential area excepting along Mount Vernon Memorial Boulevard. Less than 0.10 per cent of the building occupants traveled by means other than bus or automobile. Except for the origin (home) of the trip, the above constitutes the limits of the survey in relation to the mass transportation aspects of the study.

In order to determine the space utilization of each of the three parking lots the average daily space utilization was obtained by the previously described method of analyzing by a 5-day week as the basic unit of time. The number of spaces available, the space demand, and the number of permits issued for each parking lot are shown in table 1.

The space demand reflects the following characteristics which may often be overlooked in computing employee parking space requirements.

a. Probably the most important factor is that of the "missing person." This term is used to describe the 10 to 15 per cent of the employees who on any average day are on vacation, sick leave, or are missing from their work station in the performance of their official duties.

b. Although approximately 3,000 West Lot permits were outstanding, the highest recorded space demand on any one day did not exceed 1,100 units. This is explained by the fact that anyone working in the building could apply for and receive a West Lot permit under the system then in use. Many occupants with West Lot permits were members of car pools or used mass transit. In order to protect their permit many occupants in these two categories reported space usage in excess of actual use.

The data concerning car pooling was analyzed by individual lots. By this method, comparisons could be made between the individual lots to determine if there was a variance in the riding habits of their users. The basic unit of time used in the tabulations was the 5-day week. Table 2 lists the data obtained through this method of tabulation.

The questionnaires provided for reporting the number of people (from 1 to 6) participating in the riding arrangement and the number of days each arrangement operated in an average week. This information was tabulated as spaces per week, in accordance with the 5-day unit method previously described for each of the three parking areas. A factor was then developed to reflect the total employment.

Comparison of the vehicle occupancy for each lot indicated approximately 52 per cent of the vehicles using the Compound and South area, and 72 per cent of those using the West Lot, had only one occupant.

The corresponding inverse relationship in the per cent of pools in the two parking areas indicated a possible correlation between the location of the parking space and the tendency to pool. The development of this possible correlation between parking location and pooling was continued by plotting the per cent of each type pool (number of people in the pool, 1 to 6) in each lot on a curve as shown in Figure 4.

Examination of the graph shows that, for all practical purposes, the curves for the Compound and South area, the two lots adjacent to the building, are identical. The West Lot curve is below the other curves except for the vehicles with a single occupant.

At this point, it was felt advisable to determine the average number of persons per vehicle or the average vehicle occupancy. As indicated by the previous data, the figures for the Compound and South Lot, 2.14 and 2.12 persons, respectively, per vehicle, were nearly identical and considerably above the 1.54 persons per vehicle in the West Lot.

Originally it was suspected that the origin and/or the travel time would influence the formation of car pools. In this instance the origin and the travel time could not be considered as having a direct relationship. Trips originating on the Maryland side of the Potomac River must traverse the District of Columbia and cross one of the Potomac River bridges into Virginia. Therefore the travel time for trips originating on the Virginia side of the River is less than that for those of equivalent distance from the Maryland side.

As shown in Figure 5, the geographic area surrounding the building was divided into numbered zones. The four geographic quarters of the District of Columbia used in mail addresses are numbered as Zones 3, 4, 5, and 6. Zones 7-18 are in Virginia, and Zones 21-23, 31-33, 41-43, 51-63, and 71-73 are in Maryland. Zones 7 and 8 are North and South Arlington; Zone 9 is Alexandria; Zone 10 is Falls Church; and Zone 11 is the portion of Fairfax County surrounding Falls Church. The remaining zones are out-

TABLE 3

PERCENTAGE OF POOLS

Zone No.	Compound and South Lot			West Lot			Total		
	Total People	People Pooling No.	%	Total People	People Pooling No.	%	Total People	People Pooling No.	%
3	30	20	67	140	85	61	170	105	62
4	111	77	69	231	136	59	342	213	62
5	20	16	80	122	68	56	142	84	59
6	1	1	*	8	7	*	9	8	*
7	152	104	68	169	79	47	321	183	57
8	102	65	64	195	76	39	297	141	47
9	210	153	73	367	158	43	577	311	54
10-11	134	106	79	118	58	49	252	164	65
12-15	29	20	69	55	40	73	84	60	71
16-18	40	36	90	75	44	59	115	80	70
21-33	106	92	87	124	73	59	230	165	72
41-73	73	55	75	108	64	59	181	119	66
Totals	1008	745	74	1712	877	51	2720	1622	60

*Sample of insufficient size

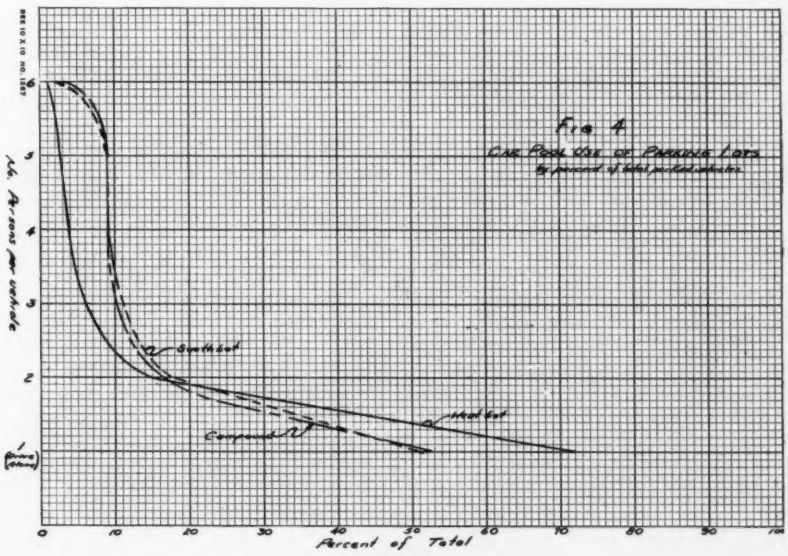

Figure 4

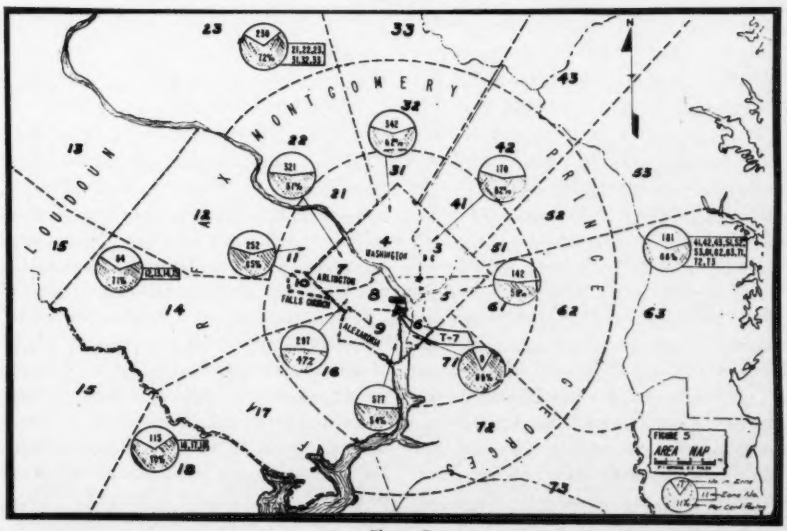

Figure 5

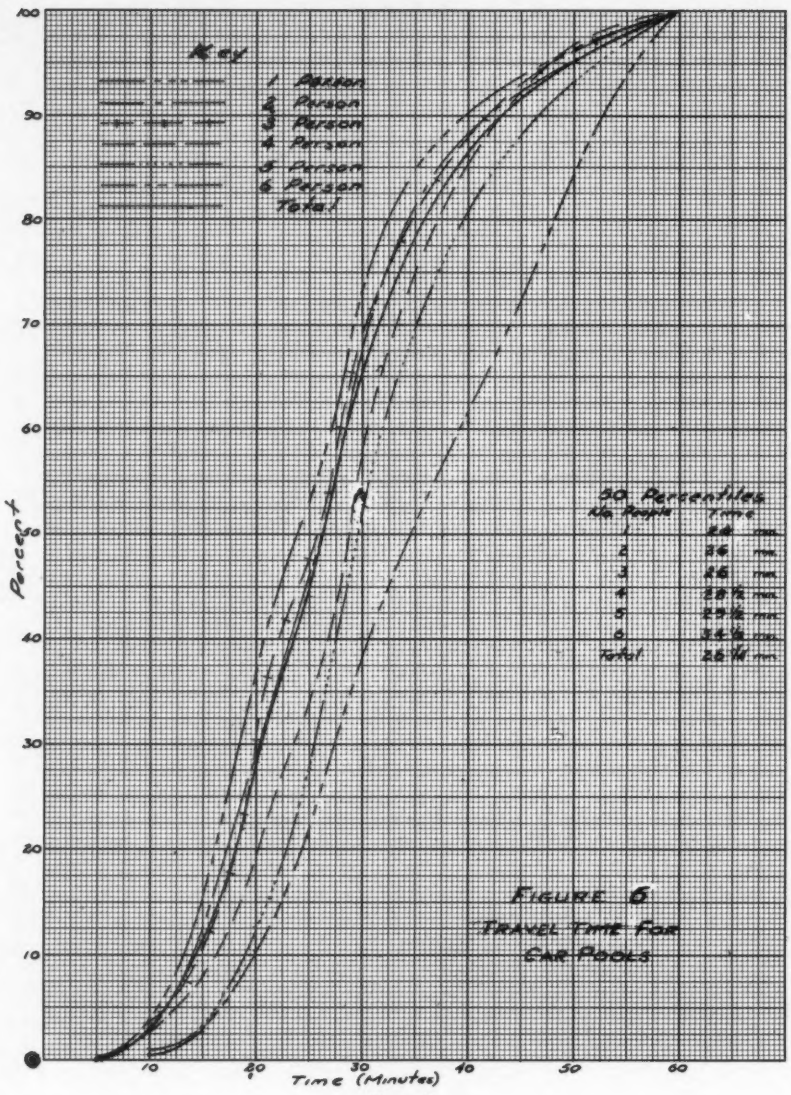

Figure 6

lying regions of Virginia and Maryland. As some of these outlying zones represent few trip origins, they are combined into larger groups.

Trip origins were assigned to the various zones by the mail addresses given on the questionnaires. Tabulations were made of the number of individuals from each zone driving alone or participating in a pool or group-riding arrangement. Table 3 summarizes the results of the tabulation.

Zones 1 and 2 represent incomplete answers and, together with bus riders, are omitted from the tabulation. Table 3 presents the data relating to trip origin, pooling, and parking-area utilization. The totaled data have been graphically superimposed on Figure 5.

Although there appears to be a slightly greater tendency to pool in the outlying zones (10 to 73), it is not felt this tendency is sufficient to draw a firm conclusion without additional sampling and evaluation.

The effect of travel time on pooling is reflected in Figure 6. As could be expected, the larger pools required longer travel time. However, the variation was considerably less than anticipated. The time increased at the rate of approximately 1½ minutes for each additional person in the pool up to 5 people. The 6-person pool took approximately 5½ minutes more than the 5-person pool. The slight difference in travel time (1½ minutes/person up to 5-man pool) does not appear to exert any appreciable influence on the formation of car pools.

This study has resulted in two primary conclusions, one dealing with the method of collecting and tabulating data relating to employee parking lots and the second dealing with the best space utilization of the parking lots.

The first conclusion concerns the method whereby the normal workweek was established as the basic time element for the collection of data. This method more accurately reflects the variation in personnel travel characteristics and also simplifies the tabulation and analysis of the data.

This method can be applied to any employee parking area. The only information necessary is that requested in questions G-2 and G-3 of the questionnaire, where the car is parked (if more than one area is available) and how many people ride in the car each day of the normal workweek. By the analysis used in this survey, the average daily space demand can be computed giving proper weight to any combination of riding arrangements.

The second conclusion is that a direct relationship exists between the individuals voluntary desire to form or join car pools and the proximity of the "pool" parking area to the working area. In the most desirous parking area immediately adjacent to the building an average vehicle occupancy of 2.1 persons existed at the time of survey. In the West Lot the average vehicle occupancy was 1.5 persons per vehicle. The other factors investigated, which were originally thought to have a bearing on car pools, did not reflect any conclusive relationship.

Further verification of the influence of parking location on the formation of pools has been reflected in the increased vehicle occupancy where the more desirable parking permits, excepting those reserved for executive use, are now being allocated on the basis of the car-pool size.

Approximately 25 per cent of the building population is now issued parking permits on this basis. Prior to the change in issuing permits, this group had an over-all average vehicle occupancy of 1.6 persons. Under the new system, the average vehicle occupancy has increased to 1.9 persons. In that portion of the Compound and South Lot assigned to this group, occupancy has increased from 2.1 to 2.6 persons per vehicle. In the South Lot alone approximately 100 more people are now being accommodated. No substantial change has been reported for the West Lot.

How Can Counties Develop An Adequate Traffic Safety Program?

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UNFORTUNATELY there is no easy answer to this question of greater safety in our counties. Perhaps the best quick answer is "through the continuing skillful use of techniques already developed." The solution to the traffic accident problem involves many things and many persons but in the end and in all units of government it lies mainly in the hearts and minds of men.

There is, in the Bible, a story of the rich young ruler who came to ask "Good Master, what good thing shall I do that I may have eternal life?" The Master's reply was clear — "If thou wilt be perfect, go and sell that thou hast and give to the poor and thou shalt have treasure in heaven, and come and follow me." But, when the young man heard this he went away sorrowful — for he had great possessions.

Thus it is many times with those who ask what they can do to promote traffic safety. I am convinced that human nature has not changed very much in 2000 years. I am convinced that few persons really want traffic safety enough to do what is required to get it. They want to keep what they have — they want no interference with their way of doing things — they want to do something spectacular or miraculous — they want to avoid the necessary day to day hard work—they want to discard what has been done and blaze new trails so they can reap the glory—SO—they go away sorrowful when they hear what is required.

In spite of much promising by many who advocate traffic safety, a considerable number of them go away sorrowful when they find that good traffic safety programs take work, sacrifice of some privileges and an outlay of money. Desire fades when these things enter the picture. The plain fact is that not many persons give more than lip service to traffic safety. If they did, there would be, already, a vocal organization in every community in the state demanding action and willing to work and pay for it. Such a desire needs to be generated.

One way to generate a desire for traffic safety is to present the facts to those most likely to be affected and those in a position to do something about it. That is the reason for this meeting today — to present the facts about and suggested remedies for Indiana's county road traffic accident problem.

We have all read and heard about the tremendous waste of lives, time and money, caused by traffic accidents in both state and nation. When we stop to consider that, in Indiana, an average of over 1100 per year have been killed and over 30,000 injured annually for the past 30 years; and that this annual toll — every year for 30 years, mind you—would require an unbroken line of hearses and ambulances 290 miles long to carry the victims we begin to see something of the scope of this problem. Hardly a person in this room has not had at least one member of his family killed or crippled for life in a motor vehicle accident. Based on the record, one of every ten persons in this room will be in a serious accident this year.

Promotion of traffic safety on county roads is the last traffic safety frontier remaining in Indiana. This does not mean that efforts in cities and on state highways are finished or even nearing perfection, but rather that county roads are virgin territory for safety effort.

Thirty years ago the problem on county roads in Indiana was not alarming. As late as twenty years ago it constituted about ten per cent of the total traffic deaths in the state — today it runs more than 20 per cent of the total. Property damage and personal injury ratios have increased in similar fashion.

This doubling of the county road's share is due to several causes, among which are these:

Doubling of the number of motor vehicles in the state,

Considerable increase in mileage driven per vehicle per year,

Spilling over of this traffic onto county roads from cities and state highways,

Migration of much of our population from city to suburbs and farms, thereby creating city traffic conditions on many county roads,

Improved county road surfaces without accompanying improvement in width, alinement, shoulders, marking and signing,

Reluctance of some county officials to attack the problem forcefully and a similar reluctance to seek or accept advice on how the problem might be met.

It should be said here that methods of traffic accident prevention are known to persons experienced in traffic work but failure to find out and apply what is already known is one of the biggest faults of those who are charged with responsbility to do something in this field.

Our effort to bring home to every citizen a realization of the extent of our traffic problem has rightfully emphasized the number killed and injured annually — but — we have neglected to give equal emphasis to the progress being made. Through the years much work and study by many persons and a great deal of trial and error by those working for safer traffic movement have brought more success than most of us realize. A terrific job has been done in Indi-

A paper presented at the Purdue Road School, April 9, 1958.

ana. In the last 20 years we have seen our state traffic death rate decrease from 17.1 per 100 million miles of travel to 5.9. What this cold statistical fact means is that without this reduction we would have killed 3925 persons last year instead of 1172.

One natural result of our failure to emphasize this success is that many incoming officials feel that no effective measures have been developed and each strikes out on his own to develop a new way to conquer the dragon singlehanded. While a certain amount of individual thought and experimentation may be beneficial, the general practice of each one going it alone results in confusion, loss of uniformity of control measures, duplication of effort and trial and error methods which finally arrive at the same error after much trial that could have been avoided. Actually the rate on county roads in Indiana is more than twice as high as that for the state as a whole. This indicates a need for counties to study and adopt methods now in use in cities and on state highways.

To see more of the broad picture it is necessary to review quickly a few more facts. The more than 76,000 miles of county highways are divided into 92 county road units varying from 180 miles in Ohio County to 1542 miles in Allen County. Most counties have more miles of roads than any state highway sub-district. Money for these roads comes from motor vehicle license and fuel taxes and distributions ranging, in 1957, from $80,649 for Ohio County to $1,892,593 for Marion County. The average county has 833 miles of roads and received last year about $446 per mile. This will be increased in the calendar year 1958 by about 15 per cent to approximately $522 per mile. If we use the 1956 count of vehicle miles on county roads we arrive at an average of about 50 vehicles per day per mile. Only a very small percentage carries more than 400 vehicles per day. About 17,000 miles or about 22 per cent of this system is surfaced with either brick, concrete or bituminous material. An unknown number of miles in each county is made up of streets in unincorporated towns. The Indiana State Road Map lists 1675 named, unincorporated places. Those ranging in size from 100 to 3000 population number about 500 or about five per county. While this mileage is not a large part of the total it must be taken into account as part of the county road problem. It is the county responsibility to control speed, erect stop and warning signs, and—if necessary—regulate parking on those streets which are not in the state system.

It is folly to think that this $446 per mile or the $522 expected in 1958 will enable even the most efficient county highway administration to provide state highway type surfaces and maintenance on any large mileage of these roads.

It is NOT folly, however, to think and demand that the most efficient use possible be made of this money and that a share of it be spent in each county for the protection of life on county highways.

Bear in mind that National Safety Council has evaluated Indiana's traffic safety organization structure as "a model for the rest of the country" and that this organization and its methods have resulted in a traffic death rate in the rest of the state that is much less than half that of county roads. It seems, then, that counties must keep their methods within the framework of this statewide program, which is built on Engineering, Education and Enforcement. We must have them all. All are important—but due to the nature of this group we must confine our thoughts here to what can be done by those who are responsible for the engineering and care of roads. And make no mistake about it — that is a very large slice of the problem. Engineering is the most positive and the most lasting of the three methods of approach.

I realize that it is common practice to blame all accidents on wild, drunk or irresponsible drivers. That, of course, is the easy way. However, when we stop to think that the fatality rate on state highways and city streets is less than half that of county roads and that the rate on the Indiana Toll Road is less than half that of state highways, we begin to see that good roads have their effect. We use the same drivers, same vehicles, same weather, same laws and same educational measures in each case. The difference lies in the roads.

How are we to do something about it:

1. Plagued as we are with too little money we may not completely work over the entire system but that cannot be accepted as an excuse for doing nothing. Roads must be classified according to traffic use and needs, and top priority given to those showing greatest needs. Perhaps the greatest need on county roads today is for road classification. No county can afford not to have a Road Classification for without it you have a haphazard arrangement of snap judgment and individual opinion.

2. The practice of splitting county road funds between the three Commissioner's Districts, as is done in some counties, without regard to road needs should be changed to a more realistic apportionment. Traffic streams like streams of water do not tend to follow evenly the boundaries of Commissioners' Districts. In bygone days when road funds came from abutting property owners there was some excuse for such division. Such conditions no longer exist. Funds contributed by highway users should be spent in their best interest without attempt to balance distribution between districts.

3. Commissioners must hire competent men for County Highway Supervisors; pay enough salary to keep a good man; give him sound policies to work by; give him enough authority to do the job; leave him alone and let him do it; and retain him in office longer than our present average of 3.5 years. County road business has become big business and requires business methods, high type administration and the use of recognized traffic safety measures rather than the pet ideas of individuals. The Commissioners must seek help on traffic matters from persons and agencies qualified to give it and then follow it. Before some one questions what business efficiency has to do with traffic safety let me add that traffic safety and efficiency are practically synonymous terms. You don't usually get one without the other.

4. A start should be made at complying with the law. Since 1939 it has been the law in Indiana that signs and markings on county roads must conform to the standards of size, color and shape and other particulars set out in the Manual of Uniform Traffic Control Devices prepared by the State Highway Commission of Indiana. To the best of my knowledge no county has fully complied in the intervening 19 years and less than 10 per cent have even started. It is time to realize that laws apply to officials as well as to individuals. It is begging the point to say that there is no penalty in the law. None should be needed for men

sworn to uphold the law. The fact remains that it was and is the will of the Legislature. A program of providing adequate signs should be started using the roads highest on the classification list first and working down. A new Manual has just been distributed by the State Highway Commission. It is the legal standard. There is no excuse for deviation from the accepted standards. My home county—Marion—is one of the worst in the state for this lack of uniformity.

5. Many roads have been given improved surfaces in recent years without any change in road width, bridge width or cutting out sharp turns or bad curves. View obstructions have been left in place and skew intersections remain as before. There is no doubt that the increase in rate and number of county road accidents is due in part to driving smooth running new cars over smooth road surfaces and being trapped into too much speed for a right angle turn or curve. These things must be considered if we are to have adequate traffic safety on county roads.

6. Counties must work for a rational speed policy. There can be no question that speeds of 65 m.p.h. — the state limit — are too high for county roads. The present law provides that the County Commissioners can establish lower limits after an engineering and traffic survey. Few have done anything. Some that have tried have erected signs without any survey, based entirely on someone's hunch, as to what the limit should be. In some cases no offiicial action was taken by the Commissioners to make the limit official. Such methods breed disrespect for all traffic regulation. We think a new law setting the top speed on county roads at 45 m.p.h. and then giving the Commissioners authority to zone either up or down from that, would be beneficial. Even now, however, there is authority under the law to remedy this condition. The State Highway Department has a traffic engineer available on request to help counties in speed zoning and other traffic surveys. With the need that is apparent on every hand he should be the busiest man in Indiana.

7. County Commissioners and County Attorneys could benefit from sitting down with State Highway Traffic Engineers and learning how to prepare traffic regulations that will stand up in court when violators are arrested. In days immediately ahead there will be more and more instances where it will be necessary to adopt traffic regulations for small towns, in built-up suburban areas, etc. They must be properly drawn before they can be enforced.

8. During most of last year there was, and now again this year there is, a State Traffic Safety Survey Team in the field making surveys of Indiana cities at the request of their mayors. These surveys are made without charge by personnel of 4 state departments. I have been and am now active in these surveys as a consultant, in assisting as advance man and in the presentation of the reports. These reports have been universally well received and have already produced some very worthwhile results. Eleven cities were completed last year and twelve more are already scheduled for this year.

There has been much discussion about the possibility of organizing a similar team for county surveys. Aside from the fact that trained manpower is not available at the moment and we have no questionnaire form prepared for use by such a team, the chief reason nothing has been done is the difficulty of getting all the necessary county officials together to request a survey, and to agree to make an honest effort to carry out its recommendations. In many counties it would be difficult to get even the three Commissioners in agreement but a complete survey would also involve the Sheriff, Supt. of Schools, the Circuit Judge and Prosecutor.

I feel that when some county gets interested enough to get these people to request a traffic survey of their county we will find the necessary manpower and ways to get it done. The highway section would be only a part of the broad survey. As I have said, no questionnaire has been developed—but when it is, it will beyond any doubt, contain most or all of the following questions. Suppose you think of the answers for your county as I read them.

1. How many persons were killed and injured on your county roads last year? What type of accidents caused these casualties?

2. How does your population rate and registration rate compare with the other counties of the state?

3. How many miles of county roads do you have?

4. How many miles of your roads have paved surfaces?

5. How many miles of these have a center line?

6. How many intersections do you have which are controlled by STOP or YIELD signs?

7. How many of the above have been placed following adoption of formal resolution by the Commissioners?

8. How many miles of your roads are in unincorporated towns and how many in built-up areas adjacent to cities?

9. What traffic control measures have been taken in these areas?

10. How many miles of sidewalks have been provided in such areas to keep pedestrians off the road?

11. Have you painted any cross walks in small towns for school crossings?

12. How many traffic signals do you operate? How do you determine where they are needed?

13. How many railroad grade crossings on your roads?

14. How many of these are equipped with gates, watchmen or flashers?

15. How many have difficult approach grades?

16. What have you done to correct these grades?

17. How many miles of your roads have been properly zoned for speed?

18. Are these areas properly signed?

19. What attention have you given to traffic control near schools?

20. What means are used to keep weeds down around traffic signs and at corners?

21. How much of your annual budget is earmarked for traffic safety and control?

22. If none, how do you provide traffic control devices when funds are all used up for construction or maintenance?

23. Where do you purchase your road signs?

24. How many did you place last year?

25. Do you read and follow the standards set out in the Manual of Uniform Traffic Control Devices?

26. How many bridges do you have on paved roads that are no wider than the road? How many of these are less than 30 feet in length?

27. How many bridges have you widened in the last year?

28. Have you considered the possibility, for instance, that instead of replacing one bridge at a cost of $50,-

(Continued on page 50)

Traffic News

Cities and States Voted Recognition For 1957 TE Activities

Fifty-three cities and eleven states have been recognized by the Institute of Traffic Engineers for traffic engineering performance during 1957.

The Institute based its recognition on performance as reported to the Annual Inventory of Traffic Safety Activities, administered by the National Safety Council. Cities reporting to the Annual Inventory and meeting or exceeding 85 per cent of the recommended performance standards were included in the list, as were states meeting or exceeding 90 per cent of the recommended standards.

Certificates recognizing these cities and states for achieving this high level of performance will be ussed by the Institute.

States recognized were: California, Connecticut, Delaware, Illinois, Maryland, Massachusetts, Michigan, Oregon, Texas, Virginia and Washington.

Cities recognized were:

Amarillo, Tex.	Madison, Wis.
Arlington, Va.	Milwaukee, Wis.
Atlanta, Ga.	Modesto, Calif.
Baltimore, Md.	New Haven, Conn.
Bloomington, Ind.	Oakland, Calif.
Boston, Mass.	Oak Ridge, Tenn.
Charlotte, N.C.	Okla. City, Okla.
Chicago, Ill.	Pasadena, Calif.
Cincinnati, O.	Peoria, Ill.
Cleveland, O.	Philadelphia, Pa.
Columbus, O.	Phoenix, Ariz.
Dallas, Tex.	Richmond, Va.
Dayton, O.	Riverside, Calif.
Detroit, Mich.	Rochester, N.Y.
E. Lansing, Mich.	Saginaw, Mich.
Enid, Okla.	Salt Lake City, U.
Evanston, Ill.	Seattle, Wash.
Fort Wayne, Ind.	Shaker Heights, O.
Grand Rapids, Mich.	South Bend, Ind.
	Springfield, Ill.
Hammond, Ind.	Springfield, Mo.
Haverhill, Mass.	Stockton, Calif.
Hickory, N.C.	University City, Mo.
Hutchinson, Kas.	Wausau, Wis.
Kalamazoo, Mich.	West Lafayette, Ind.
Kansas City, Mo.	Worcester, Mass.
Lancaster, Pa.	Youngstown, O.

Twenty-Two Attend Computer Course At New Haven

A course in the use of high speed electronic computers by highway and traffic engineers was held at the Bureau of Highway Traffic at Yale University during July. The course continued over a period of two weeks, and consisted of lectures, demonstrations, field trips to computer centers and laboratory periods during which practical highway engineering problems were solved on an electronic computer, according to Fred W. Hurd, director of the Bureau of Highway Traffic.

The course was conducted jointly by Yale University through its Bureau of Highway Traffic and the University of California through its Institute of Transportation and Traffic Engineering. The purpose of the course was to acquaint practicing highway engineers with a working knowledge of high speed computer applications in the solution of highway design and structural problems, as well as the processing of traffic operations data. Through the simulation of traffic flow, computer techniques may also be used to solve complex traffic problems, such as those which occur at intersections.

In spite of the fact that prices of computers range from $40,000 for the simplest to $4,000,000 for special purpose units, over 40 highway departments and many large cities have purchased computers to speed up and produce more accurate processing of voluminous engineering data. In the field of research, the rapid processing of complex data analysis afforded by electronic computers opens up areas of study previously unexplored. In many cases mathematical models of highway facilities may be built and tested by electronic computers before actual construction.

Instructors for the course at Yale include:

Daniel Gerlough — Assoc. Prof. of Engrg., ITTE, Univ. of Calif.

Walter Mosher — Research Asst. in Engrg., ITTE, Univ. of Calif.

Morris Davis — Director, Univ. Computer Center, Yale

David Votaw, Jr. — Assoc. Prof. in Industrial Admin., Yale

Matthew Huber — Research Associate, Bureau of Hwy. Traffic, Yale

Charles L. Miller — Asst. Prof. of Engrg., Mass. Institute of Technology

A roster of the class follows:

Abrams, Malcolm—Senior Statistician, Department of Public Works, Albany, New York

Barker, John—Development Engineer, Automatic Signal, East Norwalk, Conn.

Crowley, Kenneth—Assistant Highway Planning Engineer, The Port of New York Authority, 111 Eighth Avenue, New York 11, N. Y.

Douglass, Matthew — Instructor Civil Engineering, Howard University, Washington, D.C.

Dowd, Allen — Highway Engineer, U.S. Army Transportation Intelligence Agency, Arlington Hall Station, Arlington 12, Virginia

Fohl, Earl—Statistician III, Michigan State Highway Department, Administrative Services Division, Lansing, Michigan

Harding, Nelson—Planning Engineer, Howard Needles Tammen and Bergendoff, 1805 Grand Avenue, Kansas City 8, Missouri

Harris, William — Assistant Design Engineer, State Highway Commission, Augusta, Maine

Johinke, Keith—Traffic Engineer, Highway and Local Government Dept., 99 Currie Street, Adelaide, South Australia

Lash, Michael — Planning and Programming Engineer, U.S. Bureau of Public Roads, 500 Capitol Avenue, Hartford, Connecticut

Lawton, Lawrence—Director of Traffic Planning, Department of Traffic, 100 Gold Street, New York, N. Y.

Lewis, Russell—Instructor, Rensselaer Polytechnic Institute, Troy, N. Y.

Lepczyk, William — Highway Traffic Engineer, IIIa, Michigan State Highway Department, Lansing, Michigan

Lindler, Eric—Traffic Engineer, Wilbur Smith and Associates, 495 Orange Street, New Haven, Connecticut

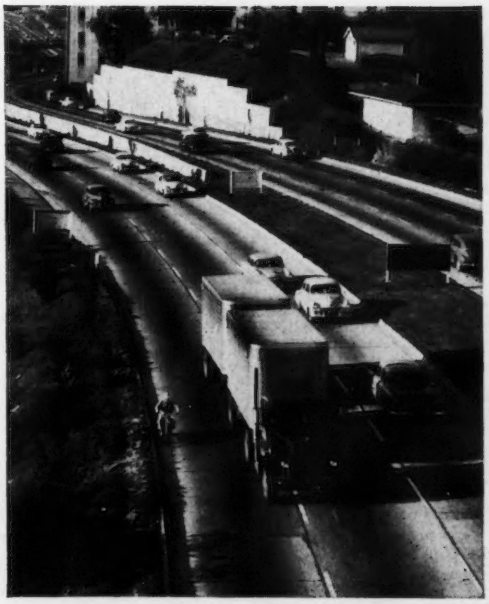
McCrone, Henry — Engineer, State House Annex, Concord, New Hampshire

ON HIGHWAYS AND BYWAYS

Parlon traffic paints dry FAST and LAST

Striping crews in the cities and in the country run into many of the same problems. First, they want a paint that will dry fast and they need a paint that won't wear off too soon. That's why so many traffic men now specify paints that are based on Parlon® chlorinated rubber.

List your traffic paint requirements. Long wear? Rapid dry? Excellent adhesion? Glass bead bond? Ease of application? Lower long-term cost? Contact your local supplier of quality paints or Hercules for detailed information on why Parlon-based traffic paints are becoming the favorite from coast-to-coast.



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Cellulose Products Department

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INCORPORATED

900 Market Street, Wilmington 99, Delaware

McGrath, William—Director, Department of Traffic and Parking, Hall of Records, 200 Orange Street, New Haven, Conn.

Rogers, Ian—Computer Planning Engineer, Sask. Dept. of Highways, Regina, Saskatchewan, Canada

Shebesta, Harvey—District Traffic Engineer, State Highway Commission, 794 N. Jefferson Street, Milwaukee 2, Wisconsin

VanAuken, Maurice—Engineer, Michigan State Highway Department, Lansing, Michigan

Wardrop, John — Principal Scientific Officer, Road Research Laboratory, Harmondsworth, Middlesex, England

Wohl, Martin—Instructor, Civil Engineering, Room 1-133, Civil Engineering Department, M.I.T., Cambridge 39, Mass.

Wong, Oliver—Civil Engineer II, Territorial Highway Department, Oahu District Office, Honolulu, Oahu, Hawaii

IRF's 3rd World Meeting Set for Mexico City October 26-31

Every phase of road construction and the highway transportation field, from modern technological developments like the use of electronics in surveying to fundamental topics like the development of a national highway system, will be covered when the world's foremost road experts gather at Mexico City, Mexico October 26-31, for International Road Federation's III World Meeting.

IRF is a non-profit service organization which promotes world roadbuilding through its member road associations in 64 nations in the free world.

More than 50 nations will be represented by their best road authorities, top government officials and prominent business leaders.

Papers will be presented on highway financing, equipment requirements for construction and maintenance, traffic engineering, highway design, highway administration, soil stabilization, highway economics, planning and directing highway conferences, development of a national highway system, increasing engineering productivity, driver training, the AASHO Road Test, planning, construction and operation of a toll road authority, pavement design, traffic surveys, international highway financing, training of operators and mechanics and road association activities.

Representatives from every major region on earth will present papers or take part in discussions. From Latin America, Roberto Parker, Minister of Public Works of El Salvador, will present Developing a National Highway System. Training Operators and Mechanics will be described by Jose J. March, Director General, Mexican Highway Association.

Among the papers from North America, Prof. Emmett H. Karrer will present Directing a Highway Engineering Conference and E. B. Wilkins, Senior Paving Engineer, Dept. of Highways, British Columbia, will relate findings of A Survey of Current Practices for Construction of Bituminous Concrete Pavements.

Economic and Social Justification for Road Development is the title of one of the British Road Federation's presentations.

From the East, the Arab Road Association will discuss The Egyptian Training Center. The Pakistan Road Engineers Association's paper is titled Economic and Social Justification for Road Development in Pakistan, while from the New Zealand Road Federation comes The Economic Benefits of Good Road Communications.

The Indian Roads and Transport Development Assn. will tell of findings of an Investigation by the Indian Roads Congress into Transport Costs. The Australian Transport Problem will be discussed by W. C. Wentworth, Member of the House of Representatives of Australia.

Delegates to the III World Meeting will be greeted on Sunday, Oct. 26 by the President of Mexico, Adolfo Ruiz Cortines, in the Palace of Fine Arts. Following will be three days of working sessions in the main building of Mexico's Secretariat of Communications and Public Works, which has been turned over to International Road Federation for the Meeting.

Inspection tours for delegates include the El Olivar Operators and Mechanics Training Center near Mexico City, which will be visited Oct. 30. El Olivar is an unique example of international cooperation in the training of highway equipment operators and mechanics.

Since its beginning in 1950 as a joint project of Mexico, the U.S. International Cooperation Administration and IRF, the Center has graduated more than 300 students a year and this year the total will be more than 1,000.

Social events connected with the III World Meeting include a visit to the Mexican President at his residence. A special program for ladies includes shopping tours, luncheons, fashion shows and sightseeing trips. Bullfights and horseraces also will be seen by delegates and their families.

A highlight of the Meeting will be a gigantic exhibit of highway equipment, sponsored by the Mexican Highway Association.

Prior to the III World Meeting, groups of foreign engineers will be taken on tours of industrial installations, highway projects and highway departments from coast to coast in the United States. Over 100 have signed up for the trip so far, which will start in Washington in late September and end in Mexico City in time for the opening session of the Meeting.

Hoffman Award Nominations Sought By ASF

Nominations are invited for the second annual Paul Gray Hoffman Award for outstanding professional service in the field of traffic safety, it has been announced by the Automotive Safety Foundation.

Mr. Hoffman, former president and chairman of the Foundation, helped to pioneer the nation's highway safety movement. One-time head of the Studebaker Corp., he was formerly ECA Administrator and served as U.S. delegate to the United Nations.

The Hoffman Award is designed to recognize and encourage the work of educators, engineers, enforcement officials, researchers, organization staff members and others who make their careers in traffic safety. One recipient is to be chosen annually for 10 years for exceptional achievement. The award is a sculptured silver plaque.

The board of judges which selects the winners from nominations submitted to the Foundation include General Alfred M. Gruenther, President, American Red Cross; Dr. John A. Hannah, President, Michigan State University; Mrs. Raymond B. Sayre, Chairman, Women's Group, President's Committee for Traffic Safety; Herschel D. Newsom, Master, The National Grange; and W. Earl Hall, Editor, Mason City (Iowa) *Globe-Gazette*.

Candidates for the Paul Gray Hoffman Award must be currently employed in the traffic safety field, draw-

ing their principal means of livelihood therefrom. The "traffic safety field" is defined as all activities described in the Action Program of the President's Highway Safety Conference, which is the accepted charter for organized traffic safety throughout the United States.

Award nominations may be made by an individual or by any local, state or national group. Each nomination must be accompanied by a brief statement (1,000 words or less) setting forth the candidate's record of traffic safety accomplishments. The record may cover any period of time, recognition not being limited to annual performance. Supporting evidence in the form of testimonials, clippings, reports, photographs, etc., may be included. However, elaborateness of exhibits will not be a factor in the decision of the judges. No special entry blanks are required.

Closing date for the 1958 award is September 1. Nominations should be addressed to the Automotive Safety Foundation, 200 Ring Building, Washington 6, D.C.

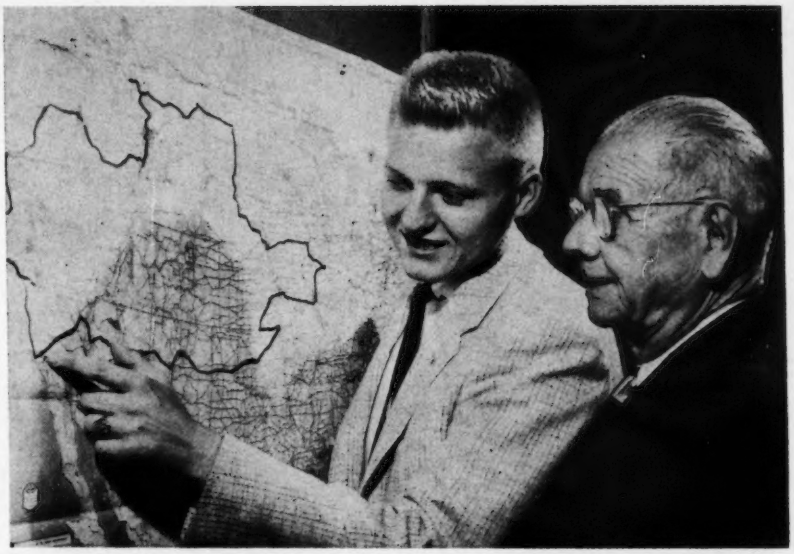
Dunn Named President Of NSPE for 1958-59

Dr. Clark A. Dunn, of Stillwater, Oklahoma, has been elected president of the National Society of Professional Engineers.

A professor of civil engineering and executive director of the office of Engineering Research at Oklahoma State University, Dr. Dunn succeeds Garvin H. Dyer, of Independence, Missouri, as head of the 46,000-member engineering group.

Dr. Dunn is a past president of the Oklahoma Society of Professional Engineers, and has served two terms as vice president of the National Society's Southwestern Region.

Six regional vice presidents and a treasurer were also elected for the administrative year which begins in July, 1958. The new vice presidents are: Harold A. Mosher, Rochester, N. Y., Northeastern Region; John B. McGaughy, Norfolk, Va., Southeastern Region; L. E. Easley, Indianapolis, Central Region; W. L. Hindermann, St. Paul, Minn., North Central Region; L. R. Durkee, Seattle, Western Region; and Noah E. Hull, Houston, Southwestern Region. Russell B. Allen, College Park, Md., was elected for his 11th term as treasurer.



Max J. Striedl, Batavia, Illinois, winner of the fourth C. C. Wiley Traveling Award in highway engineering at the University of Illinois, shows Prof. Wiley the 9,100-mile route he will follow through the West this summer, visiting highway departments, toll road authorities, universities, city and county engineers, highway contractors and projects, and equipment manufacturers in 17 states. The award provides $1,200 for summer travel to visit highway work, making pictures and a report which become property of the university for instruction purposes. It was established by an anonymous donor to honor Prof. Wiley, who retired in 1952 after 46 years on the University staff as a leader and pioneer in highway engineering. States Striedl will visit include Illinois, Iowa, Nebraska, North Dakota, South Dakota, Montana, Wyoming, Idaho, Oregon, California, Nevada, Arizona, New Mexico, Texas, Oklahoma, Kansas, and Missouri.

Catholic University Offers Course in Traffic Engineering

Catholic University of America in Washington, D.C., has announced that the Civil Engineering Department is offering a three-hour graduate level course in traffic engineering.

This course is one of four courses required for the degree of Master of Civil Engineering, majoring in Highway Engineering. Other required courses are highway economics and finance, highway design, and city planning.

Dr. Paul J. Claffey, Associate Professor of Civil Engineering, is responsible for the traffic engineering program at CU. This also includes the addition of traffic engineering material to some of the undergraduate highway engineering courses.

Boate Appointed State Safety Chairman By Harriman

Thomas N. Boate (Affiliate, ITE), manager of the Accident Prevention Department, Association of Casualty and Surety Companies, has been named chairman of the statewide Citizens Council on Traffic Safety by Governor Averell Harriman of New York.

Well-known in the traffic field, Mr. Boate has served as acting chairman of the citizens group since its organization in December of 1957. The council is composed of 100 state residents appointed by the Governor. About one-half of the members represent organizations actively interested in traffic safety programs and the other half, individuals who have been active in traffic safety work.

Job Changes

J. A. Hutter and Paul C. Box—both to George Barton and Associates from Kansas City, Mo.

Gustav A. Byrom — to Aurora, Colorado, as traffic engineer, from Miami, Florida.

Esper L. Walker, Jr.—to High Point, N. C., as city traffic engineer, from Texas Highway Department.

Floyd I. Jones—to Madison, Wisconsin, as assistant city traffic engineer, from Topeka, Kansas.

Robert H. Schleider, Jr.—from Texas A & M to Texas Highway Department.

Lamar W. Thomas—to Orlando, Florida, as city traffic engineer, from Atlanta, Georgia.

Max Tamir — to Directomat, Inc., N.Y.C., from the N.Y.C. Department of Traffic.

WASHINGTON STATE HIGHWAY DEPARTMENT
TRAFFIC ENGINEER: Rex G. Still
SIGN ENGINEER: Alan L. Solberg

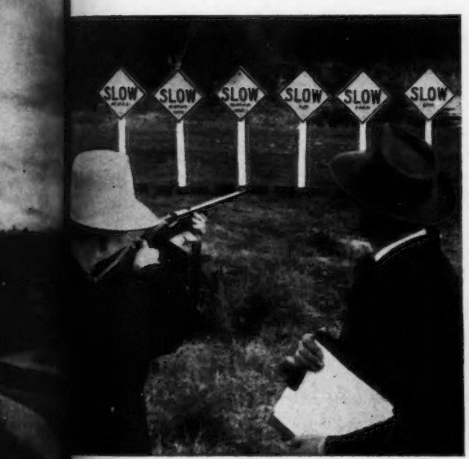
PLYWOOD SIGNS SHOW THE WAY

WASHINGTON STATE highway officials guide motorists with modern color-coded reflectorized signs of overlaid fir plywood. And because they cost less and last longer than metal signs, they mean important savings for taxpayers, too.

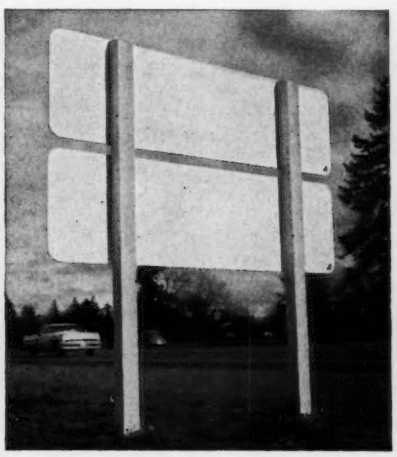
The state has standardized on High Density overlaid plywood for all large directional and informational signs. Reflective sheeting is applied direct, without prime coats. This elimination of painting saves money and the plastic-like high density overlay provides a better and more foolproof bond for the reflective sheeting. Backs are painted only where special colors are required.

For smaller warning and regulatory signs, Washington uses both High and Medium Density overlays. In the case of Medium Density, panels are primed before reflectorizing.

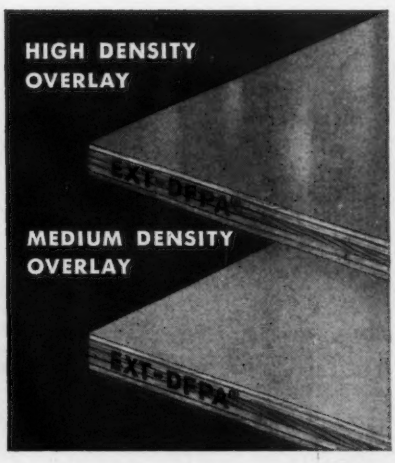
Washington has found that overlaid plywood signs stand up better under severe weathering and accidental or deliberate abuse. There is no rust, corrosion or other progressive deterioration after damage. Plywood signs are stronger and stiffer, too, and require fewer posts and framing members. Panels are light and easy to handle.



Vandalism tests conducted by Douglas Fir Plywood Association show plywood signs far stronger and more durable than steel or aluminum. Bullet holes, for example, are clean, sharply defined, with limited impact area. Write for test report.



Strength and stiffness mean larger size (up to 4′ x 8′) plywood signs can be installed without backing or framing. On king-size shoulder mounted or overhead signs, supporting framework is greatly simplified. Panels are light, easy to handle.

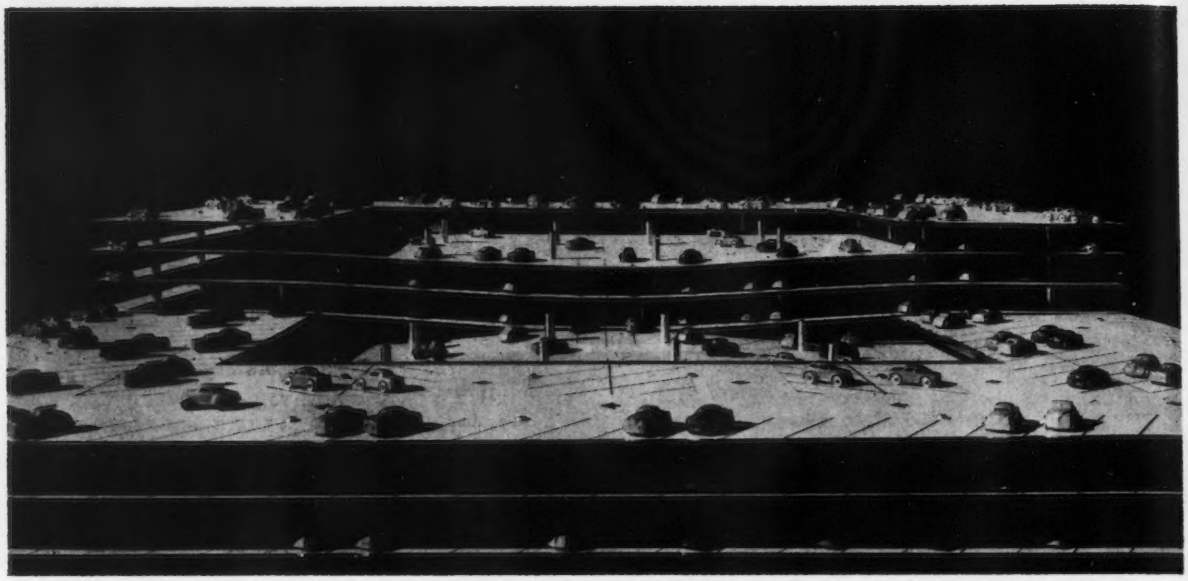


Durable overlay eliminates checking, grain raise. High Density overlay needs no paint protection; reflective sheeting may be applied direct. Medium Density is for plain painted signs. Base panel is waterproof Exterior (EXT-DFPA®) plywood.

FOR MORE INFORMATION (detailed specifications, application data, etc.) write to:

DOUGLAS FIR PLYWOOD ASSOCIATION
TACOMA 2, WASHINGTON
—a non-profit industry organization devoted to research, promotion and quality control

DFPA TESTED QUALITY



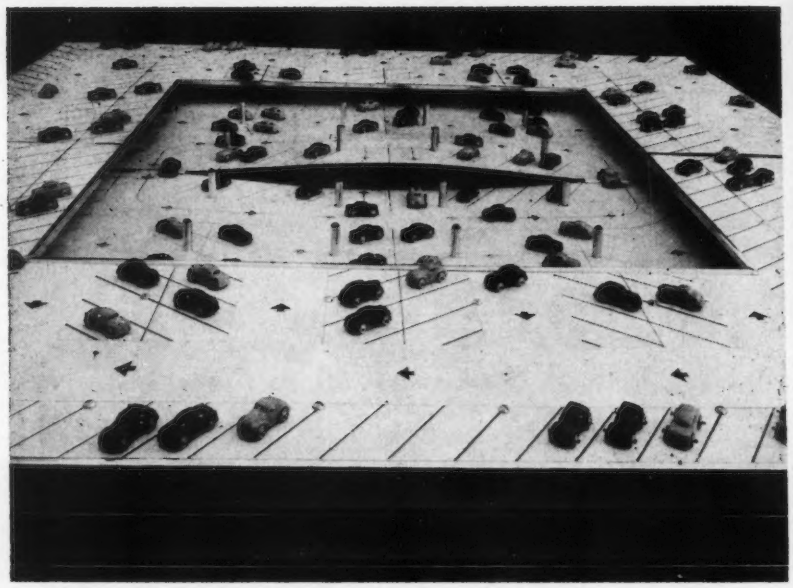
Multi-Storage Garage Without Ramps

An interesting design for a parking garage has come out of California. This novel design, not yet built, is shown in the cutaway model above. It features the total absence of ramps or elevators.

In place of ramps, its designer, E. M. Khoury of Canoga Park, California, has warped certain sections of each floor into a kind of hyperbolic paraboloid, so that each floor merges into the next and all levels are joined in an unbroken spiral from top to bottom.

The photographs of the models show how each level is shaped and how, by warping the floors, the levels are joined together. The peripheral areas of each floor are level, suggesting to Khoury that such a structure could be designed as an office building with a parking-garage core, using the curved areas for parking and all level areas at the periphery for office space. The design would allow 5 per cent more parked cars than a conventional ramp design of equal size.

Construction can be as straightforward as in a conventional design, Khoury says, because the warped parabolic areas can be designed as straight, sloping lines, rather than as curved surfaces, and the structure can have steel instead of reinforced concrete as its skeleton. Construction is made easy by the nature of the design: every point on the floor is the same height above the floor below.



316,000 Police Reported In U.S. by Census Bureau

Police functions of the various Federal, State and local Governments in continental United States employed the services of approximately 316,000 persons last year, according to a summary report on results of the 1957 Census of Governments issued by the Bureau of the Census, Department of Commerce. This figure included some part-time employees as well as those who devoted full time to police work; it covers clerical, administrative, and custodial personnel as well as uniformed police.

On a full-time equivalent basis, employees in the police services numbered 290,000, or 17 police employees for each 10,000 of the population in the continental United States. An additional 4,293 persons were employed in police activity in Alaska, Hawaii, and Puerto Rico.

Federal civilian employees in the police service numbered 22,000 in 1957; State employees, 27,600; and local (municipal, county, or township) employees, 266,600, of whom 262,400 were engaged on a full-time basis.

Of the police employees of local governments those employed by counties numbered approximately 37,500, and those employed in the nation's

municipalities, 214,600. In the six New England States, and New York, New Jersey, Pennsylvania, Michigan, and Wisconsin, townships also employed about 14,500 persons in police work.

Police Employment, by States

The 1957 Census of Governments recorded the following State and local police employment:

Alabama, State 603 and local 2,932; Arizona, State 175 and local 1,279; Arkansas, State 265 and local 1,401; California, State 2,791 and local 24,000; Colorado, State 353 and local 1,946; Connecticut, State 565 and local 4,445; Delaware, State 216 and local 424; District of Columbia, 2,878; Florida, State 720 and local 6,585; Georgia, State 580 and local 4,550; Idaho, State 193 and local 726; Illinois, State 1,055 and local 17,953; Indiana, State 889 and local 5,471; Iowa, State 426 and local 2,526; Kansas, State 212 and local 2,599; Kentucky, State 613 and local 2,973; Louisiana, State 612 and local 4,504; Maine, State 229 and local 1,246; Maryland, State 521 and local 5,794; Massachusetts, State 604 and local 11,873; Michigan, State 1,397 and local 12,843; Minnesota, State 292 and local 3,608; Mississippi, State 368 and local 1,720; Missouri, State 657 and local 6,299; Montana, State 141 and local 791; Nebraska, State 196 and local 1,710; Nevada, State 49 and local 582; New Hampshire, State 91 and local 970; New Jersey, State 1,038 and local 14,386; New Mexico, State 171 and local 818; New York, State 1,463 and local 41,343; North Carolina, State 723 and local 4,083; North Dakota, State 55 and local 725; Ohio, State 1,781 and local 12,695; Oklahoma, State 498 and local 2,414; Oregon, State 461 and local 2,067; Pennsylvania, State 2,114 and local 17,587; Rhode Island, State 193 and local 1,799; South Carolina, State 415 and local 2,519; South Dakota, State 137 and local 664; Tennessee, State 580 and local 3,587; Texas, State 680 and local 10,577; Utah, State 230 and local 990; Vermont, State 219 and local 314; Virginia, State 743 and local 4,098; Washington, State 577 and local 3,269; West Virginia, State 335 and local 1,555; Wisconsin, State 279 and local 6,079; Wyoming, State 59 and local 437. Outside continental United States: Alaska Territory 87, local 145; Hawaii Territory none, local 932; Puerto Rico Commonwealth 3,020, local 109.

Training Opportunities

August 25-29—SHORT COURSE IN FUNDAMENTALS OF TRAFFIC ENGINEERING—
To be held at the University of California at Los Angeles under the auspices of the Institute of Transportation and Traffic Engineering. Classes will be held in the Business Administration and Economics Building on the UCLA campus. Tuition—$35, which includes course syllabus, notes and a dinner. For further information, address: Institute of Transportation and Traffic Engineering, University of California, Los Angeles 24, California.

September 24-26 — FREEWAY OPERATIONS SEMINAR —
The third in the current series will be held at the Northampton Hotel, Northampton, Massachusetts, under the sponsorship of the New England Section of the Institute of Traffic Engineers. Traffic engineers, design and planning engineers, police traffic supervisors and others with responsibility for present or future operation of controlled access facilities in Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York (upstate), Quebec and Ontario are invited. For reservation forms and additional information, contact Roger T. Chandler, City Traffic Engineer, 147 Fountain Street, Providence 3, Rhode Island, or ITE, 2029 K Street N.W., Washington 6, D.C.

October 6-8—FREEWAY OPERATIONS SEMINAR
The fourth in the current series will be held at the Holiday Inn motel west of Harrisburg on the Pennsylvania Turnpike (at U.S. 15) under the sponsorship of the Mid-Atlantic Section of the Institute of Traffic Engineers. Traffic engineers, design and planning engineers, traffic police supervisors and others with responsibility now or in the future for operation of controlled access facilities in Pennsylvania, New Jersey, Delaware, Maryland, District of Columbia, New York (western part), Virginia and Ontario are invited. For reservation forms and additional information, contact Paul D. Muffley, Highway Planning Engineer, Pennsylvania Department of Highways, 21st & Herr Streets, Harrisburg, Pa., or ITE, 2029 K Street N.W., Washington 6, D. C.

October 29-30 — COMPUTER APPLICATIONS SYMPOSIUM—
The Fifth Annual Computer Applications Symposium, sponsored by Armour Research Foundation, will be held in Chicago October 20 & 30. For information, write: Armour Research Foundation of Illinois Institute of Technology, 10 West 35th Street, Chicago 16, Illinois.

Coming Events

September 16-20 — FOURTH INTERNATIONAL STUDY WEEK IN TRAFFIC ENGINEERING—
Copenhagen, Denmark, Contact: World Touring and Automobile Organization, 32 Chesham Place, London, SW1, England.

September 28-October 1 — AMERICAN PUBLIC WORKS ASSOCIATION—
Muehlebach Hotel, Kansas City, Mo. Contact: APWA, 1313 E. 60th St., Chicago, Ill.

October 13-15 — AMERICAN TRANSIT ASSOCIATION—
Roosevelt Hotel, New Orleans, La. Contact: ATA, 292 Madison Ave., N.Y.C.

October 13-17 — AMERICAN SOCIETY OF CIVIL ENGINEERS—
National Convention, Statler Hotel, New York City. Contact: ASCE, 29 W. 39th St., N.Y.C.

October 20-23 — INTERNATIONAL MUNICIPAL SIGNAL ASSOCIATION—
Sheraton Hotel, Philadelphia, Pa. Contact: IMSA, 130 W. 42nd St., N.Y.C.

October 20-24—NATIONAL SAFETY CONGRESS
Conrad Hilton, Congress and other hotels, Chicago, Ill. Contact: NSC, 425 N. Michigan Ave., Chicago, 11, Ill.

October 26-30 — AMERICAN INSTITUTE OF PLANNERS—
New Yorker Hotel, New York City. Contact: AIP, Suite 410, 2400 16th St., N.W., Washington 9, D.C.

October 26-31—INTERNATIONAL ASSOCIATION OF CHIEFS OF POLICE—
Hotel Fontainebleau, Miami Beach, Fla. Contact: IACP, 618 Mills Bldg., N.W., Washington 6, D.C.

October 26-31 — INTERNATIONAL ROAD FEDERATION THIRD WORLD MEETING—
Mexico City, D.F. Contact: IRF, 1023 Washington Bldg., Washington 5, D.C.

MOTOR VEHICLE DEATHS AND DEATH RATES

1956, 1957 and 1958

	1956	1957	1958	1956-58 Change	1957-58 Change
January	2,954	2,880	2,740	— 7%	— 5%
February	2,652	2,480	2,360	—11%	— 5%
March	2,940	2,890	2,630	—11%	— 9%
April	2,970	2,950	2,600	—12%	—12%
May	3,094	3,000	2,910	— 6%	— 3%
Five Months	14,610	14,200	13,240	— 9%	— 7%
June	3,338	3,310			
July	3,555	3,240			
August	3,535	3,690			
September	3,653	3,330			
October	3,476	3,450			
November	3,603	3,570			
December	3,858	3,710			
Total	39,628	38,500			

All 1956 figures are from the National Office of Vital Statistics.
All others are National Safety Council estimates.

November 10-14 — INSTITUTE OF TRAFFIC ENGINEERS—
28th Annual Meeting, Deauville Hotel, Miami Beach, Florida. Contact: ITE, 2029 K St., N.W., Washington 6, D.C.

November 28-December 5—AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS—
Annual Meeting, Sheraton-Palace Hotel, San Francisco, Calif. Contact: AASHO, National Press Bldg., Washington 4, D.C.

November 30-December 3—AMERICAN MUNICIPAL ASSOCIATION—
Hotel Statler, Boston, Mass. Contact: AMA, 1625 H Street N.W., Washington 6, D.C.

1959

January 5-9—HIGHWAY RESEARCH BOARD—
Sheraton Park Hotel, Washington, D.C. Contact: HRB, 2101 Constitution Ave., Washington 25, D.C.

New Publications

Tests of Energy-Absorbing Traffic Barriers

Bulletin 185, Highway Research Board, 2101 Constitution Avenue, Washington 25, D.C. May 1958. 29 pp. 60¢

This bulletin contains two papers sponsored by the Committee on Guardrails and Guide Posts, as presented at the 36th Annual Meeting of the Highway Research Board.

The first, by Russell R. Skelton, describes crash barrier tests on multiflora rose hedges as carried out by the author for the Bureau of Public Roads. The test results indicate that many serious automobile accidents could be prevented in the future if hedges of this variety were planted now in the median strips of divided highways.

The second, by Norman L. Pedersen, John H. Mathewson, and Derwyn M. Severy, describes the development and testing of an energy-absorbing barrier for highways. The barrier consists of a series of corrugated concrete slabs extending about 2 feet above the road surface and arranged in a row in the center of the median strip. The tests indicate the feasibility of providing a collapsible barrier to govern the deceleration of out-of-control vehicles to prevent injury to the vehicle occupants and prevent head-on collision.

Development of New Non-Skid Road Surface Treatment

Bulletin 184, Highway Research Board, 2101 Constitution Avenue, Washington 25, D.C. May 1958. 16 pp. 50¢

This bulletin contains two papers on this subject as presented at the 36th Annual Meeting of the Highway Research Board.

The first, by H. S. Nagin, T. G. Nock and C. V. Wittenwyler, describes development and laboratory and field testing of a new skid-resistant roadway surface treatment based on thermosetting epoxy resins. Included in the discussion are descriptions of several methods of application used in the field.

The second, by Warren M. Creamer and R. E. Brown, describes the service testing of the same surface treatment as applied to the concrete apron and toll booth area at the Milford Toll Station on Connecticut's Wilbur Cross Parkway. The good safety record at this location since installation of the surfacing testifies to its effectiveness as a skid-resistant material. Frequent physical testing of the coating has indicated little degradation of the coating or of its adhesion to the underlying concrete.

Vehicle Performance As Affected By Pavement Edge Lines and Traffic Signals

Bulletin 178, Highway Research Board, 2101 Constitution Avenue, Washington 25, D.C. April 1958. 20 pp. 60¢

This Bulletin contains two papers presented at the 36th Annual Meeting of the Highway Research Board, as follows:

"Platoon Movement of Traffic from an Isolated Signalized Intersection," by Brian J. Lewis. The paper discusses an investigation of the extent to which motor vehicles remain bunched together when traveling freely down a semi-expressway type of facility after having been formed into platoons by an isolated signalized intersection. A definite pattern of vehicle performance prevails, and a method is suggested for coordinating the timing of a second traffic signal to afford less delay to the traffic stream than if allowed to operate in some entirely random manner.

"Pavement Edge Lines on 24-Foot Surfaces in Louisiana," by I. L. Thomas, Jr. It is concluded that the psychological effect on a majority of vehicle drivers is the only benefit from pavement edge lines, and that the tendency of vehicles to move toward the center of edge striped pavements does not appear sufficient to create any abnormal hazard on a 24-foot surface; however, this may not be applicable to narrower pavements.

The Municipal Yearbook, 1958

Orin F. Nolting and David S. Arnold, editors. International City Managers' Association, 1313 East 60 Street, Chicago 37, Illinois, June, 1958. 598 pp. $10 postpaid.

The 25th annual volume of the *Municipal Year Book* provides a comprehensive review of municipal government in the United States.

Highlights of the 1958 edition include special sections on municipal debt and public improvements planned and financed for the next five years. The municipal debt section presents the latest issue of general assessligation, revenue, and special assessment bonds issued in 1957 by 550 cities over 10,000 population and shows the dollar amount of bonds issued for off-street parking, street lighting, and other types of improvements.

Other new sections provide statistical and analytical data on organization, personnel, and financing for municipal airports; regulation of curb loading zones in the central business district; and developments in urban counties.

In the regular sections of the *Year Book* new information is presented on special censuses for cities over 5,000 population, annexations, and other metropolitan area developments, use of school crossing guards, employee organizations in cities over 10,000, and types of public improvements required for new residential subdivisions before the plat can be approved by the city government.

In addition to these new sections, most of the regular sections of the *Year Book* have been retained and brought up to date. These features include form of government, salaries of municipal officials, personnel organization, financial statistics, parking lots, police and fire data, directories of city officials, bibliographies in various fields, and model municipal ordinances.

BOUND FOR EUROPE?

Charles Zell of Sacramento is planning a trip to Europe during parts of October and November. He will pick up a car there and tour various countries, and is looking for another traffic engineer to provide company —and to share the expense. If you are interested, write directly to

Charles E. Zell, California Division of Highways
P. O. Box 1499, Sacramento, Calif.

Strictly Business

Union Metal Offers New Guide to Poles for Lighting and Signing

"Monotube Poles for Highway Lighting and Signing" is the title of a new 24-page folder just released by The Union Metal Manufacturing Company.

Popular highway pole designs, in both steel and aluminum, as well as various overhead sign mounting arrangements are illustrated and catalogued in easy to follow form. Base and bracket details, guide specifications and typical installation photographs complete this helpful reference to correct highway lighting and signing pole selection.

For your copy of Folder LS-23, address The Union Metal Manufactur- Company, Canton 5, Ohio.

Flex-O-Lite Introduces New Reflective Glass Sign Bead

A new reflective glass bead, designated as UB 68, for application to backgrounds of thruway signs, has been placed on the market by the Flex-O-Lite Manufacturing Corporation, St. Louis. An ultra bright bead in the medium index classification, the product is particularly recommended for use on signs in the darker pigmented colors such as greens, blues and reds, according to P. D. Law, president.

Designed for 'round-the-clock protection of motorists on the nation's highways, the bead is said to assure impressive reflectivity under all weather conditions, and to offer maximum possible angularity up to the point of passing. Chemical stability and long life as well as ease of application, and a minimum of maintenance are claimed for the product, qualifying it for large reflectorized overhead signs, distance and destination signs, red stop signs and kindred applications.

An important addition, UB 68 Reflective Glass beads augment the Flex-O-Lite line. Announced earlier was the Flex-O-Lite #831 High Index Bead for white and yellow traffic signs, street name signs and license plates.

The company also announced the availability in the near future of an improved reflective glass bead dispenser, accommodating panels up to 48" wide. Factory production of the dispenser is scheduled for mid August, executives of the company said.

For further information address Flex-O-Lite Manufacturing Corporation, 8301 Flex-O-Lite Drive, P.O. Box 3066 (Affton Br.) St. Louis 23, Mo.

Aluminum Sign Hardware Produced By Hawkins-Hawkins

A complete line of aluminum sign hardware for agencies producing their own street name signs is available from Hawkins-Hawkins Co. Offered at competitive prices, this hardware is being used by cities, counties and states. It is specially designed to hold street name plates designed in conjunction with the "Scotchlite" program of reflectorizing street name signs.

The materials available include caps to fit all sizes of pipe from 1½" to 3½" I.D., as well as brackets for electroliers and a special patented cap to fit channel U-posts.

Also produced by this firm are name plates of aluminum reflectorized with flat-top "Scotchlite" or embossed name plates of 18 - gauge zinc - coated steel with flat - top "Scotchlite." Embossed name plates with either baked enamel or porcelain finishes are also furnished. The normal variety of plates is produced, with and without block numbers, and with or without borders.

For further information and prices, contact Hawkins - Hawkins Co., 1255 Eastshore Highway, Berkeley 10, California.

New Highway Lighting Manual Available from General Electric

A comprehensive, 60-page Highway Lighting Manual (GET-2742) is now available to traffic engineers interested in highway lighting. Copies of the publication may be obtained by writing on professional letterhead to A&SP Department, Outdoor Lighting Department, General Electric Co., Hendersonville, N. C.

The manual, published last fall, has already been distributed to many traffic and highway engineers, consulting engineers for state highway departments, and engineers of the Bureau of Public Roads.

Included in the publication are a glossary of basic lighting terms, a discussion of why highways should be lighted, information on how much light is needed for various highway applications, equipment comparisons, systems cost comparisons, equipment descriptions, circuit diagrams, maintenance information, and typical layouts of interchanges and other highway "danger spots" that call for fixed lighting.

For each of the 18 typical lighting layouts, the manual provides a list of required materials for mercury, fluorescent, or filament systems using either series or multiple control. A table is also provided to show the recommended mounting heights, average level of illumination, and total number of poles and luminaires required for each system and each application.

Shown at the site of a new changeable sign in Los Angeles are (l. to r.): Frank R. Haggerty, Tele-Dynamics, Inc.; Deputy Chief Harold Sullivan, Commander of Los Angeles Police Department Traffic Bureau; S. S. (Sam) Taylor, General Manager, Los Angeles Department of Traffic; Jack E. Eckhardt, District Traffic Engineer, California Division of Highways, and Grannis P. Parmelee, Manager, Sign Services, Auto Club of Southern California. The sign is used to route trucks around a business area by directing truck traffic into the left lane during certain hours and into the right lane during other hours. In its changed position, the arrow appears at the right side of the wording, over the right lane.

Cal-Met, Newest Development in Traffic Sign Industry

California Metal Enameling Company announced a revolutionary new sign series in June. This new line, called CAL-MET, incorporates a new and unique development in the manufacturing of traffic signs with reflective sheeting, according to the company.

Cal-Met's distinctive feature is the Armco aluminized steel face plus a permanent vitreous enamel back in the approved color for every type of traffic sign. This line combines the strength and toughness of steel with corrosion - resistant aluminum. Signs can be ordered with the reflective Scotchlite sheeting aplied to the face prior to shipment—or blank for appli-

cation of the sheeting in the customers' own shops.

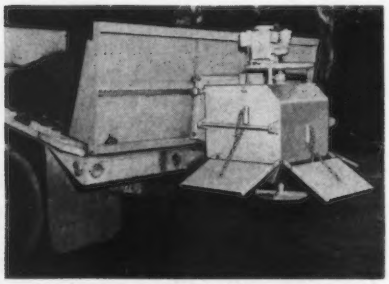
In discussing the new line, officials of California Metal Enameling Company said: "Cal-Met signs are designed to supplement our present extensive line of CAMEO porcelain enamel traffic signs, using reflector buttons." Cal-Met blanks, with the exclusive enamel back in permanent color, are said to be less expensive than bare aluminum blanks. All posts and corners are rounded and brace holes are provided. The blanks are available with all symbols and in all regulatory colors.

A large supply of various sizes and types of blanks are stocked for immediate delivery.

Complete technical data showing prices, shapes, sizes and shipping information is available by writing to California Metal Enameling Company, 6904 East Slauson Avenue, Los Angeles 22, California.

Salt and Cinder Spreader Offered By Pennsylvania Firm

A new centrifugal cinder and salt spreader for highway use has been announced by the manufacturer, Voich Brothers, Irwin, Pa. This belt driven unit has no gears or sprockets to wear out and is powered by a four cycle Briggs and Stratton gasoline engine. Installation is quickly done by attaching the Spreader to the truck tailgate with 4 bolts.

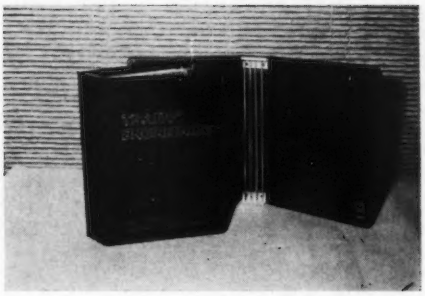


Cinders or salt is fed from the truck body through a door in the tailgate into the spreader. From here the material is evenly spread by the spinning action of the distributing disc. Adjustable deflectors and the speed of the distributing disc control the area of spread. Periodic greasing is the only required maintenance. Since the Voich Spreader is self-aligning it remains in a level position regardless of the degree of elevation of the truck body.

The unit weigh 180 pounds and measures 28″ x 27″ x 40″.

(Continued on page 50)

By Popular Demand



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Institute Affairs

Sacramento Seminar Held

The second in the 1958 series of Freeway Operations Seminars was held in Sacramento, California, on June 16, 17 and 18. The total registration was 121, of which approximately 50 per cent were traffic engineers, 20 per cent design, 10 per cent enforcement, 5 per cent planning, and 5 per cent teachers. The remaining 10 per cent was spread over a number of fields. Most of those registered were from California, but there were at least two representatives from each of the eleven Western States. There were 56 state people, seven from the Bureau of Public Roads, 33 from cities, six from counties, and 24 unclassified (associations, consultants, etc.).

Planning for the Seminar was ably handled by a local committee under the chairmanship of George M. Webb, assisted by Karl Moskowitz and R. J. Israel. Aiding in the actual operation were Dudley Stevens, Henry Case, Roy Matthews, and O. C. Hinton.

The program for the Seminar was arranged by the Steering Committee, under the chairmanship of E. G. Wetzel, and with C. C. Robinson serving as secretary. Speakers included the following:

B. W. Booker, Asst. State Highway Engineer, Calif. Div. of Highways
B. R. Caldwell, Commissioner, California Highway Patrol
C. M. Gillis, Director, Calif. Department of Public Works
J. E. Havenner, President, ITE
A. L. Himelhoch, District Engineer—Operations, Calif. Div. of Highways
D. W. Loutzenheiser, Chief, Highway Design Div., Bureau of Public Roads
A. F. Malo, Director, Detroit Dept. of Streets and Traffic
J. H. Mathewson, Assistant Director, Institute of Trans. and Traffic Engineering, U. of C.
O. K. Normann, Deputy Asst. Commissioner for Research, Bureau of Public Roads
W. H. Polkinghorn, Director of Traffic, Detroit Police Dept.
E. R. Ricker, Traffic Engineer, N. J. Turnpike
H. W. Sullivan, Deputy Chief of Police, Los Angeles
S. S. Taylor, General Manager, L. A. Dept. of Traffic
G. M. Webb, Traffic Engineer, Calif. Div. of Highways

Seminars 3 and 4 Scheduled

As previously announced, the next Seminars have been scheduled. The third in the series will be held under the sponsorship of the New England Section in Northampton, Massachusetts, beginning Wednesday morning, September 24 and ending Friday afternoon, September 26. Local arrangements, including registration, is in the hands of a committee headed by Roger Chandler, City Traffic Engineer, 147 Fountain Street, Providence, R. I.

The next Seminar is set for October 6 to 8 (Monday morning through Wednesday afternoon) at Harrisburg, Pennsylvania. The Mid-Atlantic Section is sponsoring this affair, with the local arrangements committee headed by Paul D. Muffley, Planning Engineer, 21st and Herr Streets, Harrisburg, Pa. Co-chairman is A. E. Keeley of Huntingdon, Pa.

ITE Director Elected President of WSE

W. R. Marston, Director of the Institute from District 4 and Deputy City Traffic Engineer of Chicago, has been elected president of the Western Society of Engineers. This is one of the major engineering societies, with headquarters in Chicago and a very broad membership in the engineering profession. Congratulations, President Marston!

Institute Birthplace Honored

Headquarters recently received a beautiful framed photograph (in color) of Pittsburgh's Golden Triangle, with a caption reading: "1958 Pittsburgh, Pennsylvania '*1930 Birthplace*' Institute of Traffic Engineers." This photograph now hangs in a place of honor in the headquarters office.

The arrangements for this were made by the Mid-Atlantic Section, and involved Philadelphia as well as Pittsburgh. We understand that the original photograph was the property of the Atlantic Refining Company and was actually used in some of their advertising. Although Pittsburgh of 1958 is a far cry from the city of 1930 when this organization was founded there, the picture is an artistic as well as a symbolic addition to the Institute office.

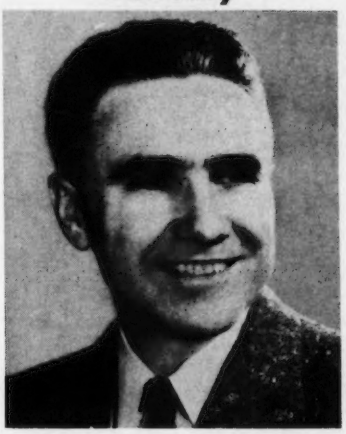
Thanks to all who had a hand in this!

Insurance Benefits Paid to Two Institute Widows

Two $7,500 checks have been delivered in recent weeks to widows of Institute members because their husbands had been far-sighted enough to join the ITE Insurance Plan. This makes a total of three claims paid since the inception of the Plan 18 months ago.

It is hoped that another opportunity may be given Junior members to enroll this fall under a general enrollment period. This has been discussed by the Trustees, who believe that the Plan offers members a bargain which has not been fully recognized by Juniors.

Obituary



LeVerne Johnson

LeVerne Johnson (Assoc. Mem., ITE) died suddenly at his home in Vienna, Virginia on July 5. He was 48 years old.

At the time of his death, Johnson was manager of the D.C. Division of the American Automobile Association, a post he had held since 1952. Prior to that, he had been in the traffic engineering and safety department of the AAA as associate director.

Johnson graduated from Iowa State College and worked for two years there under Professors Lauer and Moyer. After a brief stint with the U.S. Engineers at Rock Island, he came to Washington in 1936.

From 1944 to 1946 he served in the Navy and was active in the Naval Reserve, holding the rank of Lieutenant Commander. Active in church and civic affairs, he was an elder of the church, an advisor on Boy Scout activities, and a member of the Engineers Club, Toastmasters International, and the Antique Automobile Club. He was also active with the District Commissioners' Traffic Advisory Board.

He is survived by his widow and three sons, all at home.

Section News

WESTERN SECTION

New officers elected at the Sacramento meeting in June:

President: Robert E. Dunn
Vice President: Ross T. Shoaf
Secretary-Treasurer: Charles E. Haley

Western Section officers and convention committee at the annual meeting of the Section in Sacramento in June: (standing, l. to r.) Charles E. Haley, A. R. Pepper, Jack A. Bruce, Martin Bouman, and Robt. E. Dunn; (kneeling, l. to r.) Ellis Mathes, Karl Moskowitz, J. Al Head, Ross Shoaf, and M. H. West.

METROPOLITAN (N.Y.) SECTION

New officers elected at the June meeting:

President: Arnold G. Fisch
Vice President: Gordon K. Gravelle
Secretary-Treasurer: Warren Travers

MISSOURI VALLEY SECTION

New officers for 1958-59 are:

President: A. J. Basile
Vice President: Ellis C. Henry, Jr.
Secretary-Treasurer: George C. Lichty

SOUTHERN SECTION

On June 25, a group of Southern Section members and affiliates living in Virginia met in Richmond to organize the Virginia Division of the Southern Section. A constitution and a set of by-laws were adopted, and officers were elected. Selected to serve until the annual meeting in 1959 were:

President: Kenneth M. Wilkinson
Vice President: Clifton G. Stoneburner
Secretary-Treasurer: J. Duval Lee

Functioning within the framework of the Southern Section, the new Virginia Division will provide an opportunity for more frequent meetings and for more active participation in affairs of the Institute and the profession.

TEXAS SECTION

Sixty-five members and affiliates of the Texas Section attended the semi-annual meeting of the Section held June 21 in Corpus Christi. Under the able planning of host Paul Rice, an interesting technical meeting as well as an extremely enjoyable social gathering took place.

The technical session included addresses by City Manager Russell E. McClure, Mr. Granville W. Moore of the Greater Dallas Planning Council, Mr. W. W. Anderson, Corpus Christi Director of Planning, and Lloyd M. Braff, Executive Director of the Dallas CBD Association.

Following a luncheon and brief business meeting, the group had a guided tour of the famous King Ranch, some 850,000 acres. Needless to say, not all the area was covered! The evening was spent on board the "Gulf Clipper" which cruised Corpus Christi Bay while a buffet dinner was served.

MIDWEST SECTION

With the close of the May meeting, the Midwest Section terminated its formal monthly gatherings for the summer. Two activities, more informal in nature, marked the month of June. These were the Section's annual field trip and the F and F outing in Wisconsin, also an annual event. In August, it is expected that a large group will descend on *Bill Marston's* "little" place in Woodmar for the Midwest Section's Annual Family Outing and Picnic. September 18th will find Midwest ITEs back in the monthly meeting groove, with the first fall meeting to include a sports film.

It had been decided earlier this year that the Midwest Section Field Trip would be to Ottawa, Illinois, to inspect the AASHO Test Road now being constructed. Wherefore, on June 12th about 32 section members boarded a Greyhound Scenicruiser bus and headed for Route 66. After a two hour ride and a light lunch, a stop was made in Ottawa at the District 3 office of the Illinois Division of Highways, *Art Dierstein's* base of operations. After inspecting the office, garage, and shops, the group continued on to the site of the Test Road, just outside of Ottawa. On a guided tour of the test area, the ITE's had explained to them the organization, goals, methods, and types of test equipment of the AASHO group. The test road, laid out in a series of loops, each about 1½ miles long, will start carrying traffic this fall. Its purpose will be to determine the effect of varying axle loadings on pavement constructed of different materials, with the thickness of pavement, base, and subbase also being varied.

The group then moved on to Starved Rock State Park, where a softball game was immediately organized. Afterwards, the members were treated by *Art Dierstein* and Company to a picnic supper, featuring barbecued chicken. As the sun sank slowly in the West, the group straggled back aboard the bus and headed home. The return trip was enlivened by the histrionic talents of the well-known thespian, Mr. *Peter M. Page.*

HIGHWAY ADMINISTRATOR

(Continued from page 11)

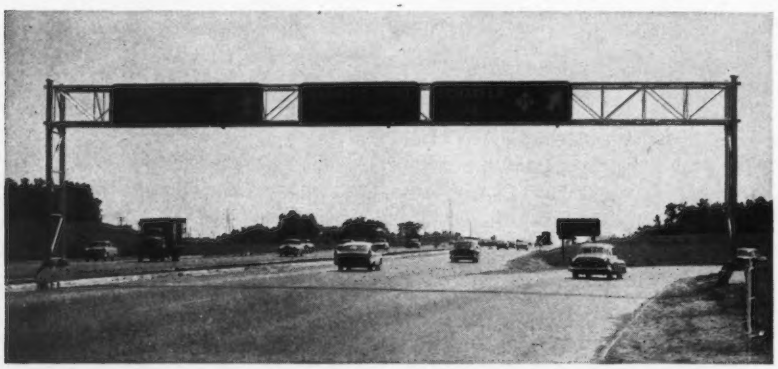
Let me point out that the highway engineers and planning officials were taken by surprise by the motor vehicle and its dynamic development. As a consequence, highway services fell way behind the design of the vehicle. Highways didn't keep pace with needs. It was in this vacuum that the traffic engineering profession was born and has flourished.

We don't want to make this mistake again. The penalty for failure is too great a one to bear.

Whether we meet the future successfully depends upon the traffic engineering profession.

The challenge is yours!

I know that you will not fail to meet its demands.



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Letters to the Editor

June 24, 1958

Dear Sir:

The May 1958 issue of TRAFFIC ENGINEERING contains an article titled "Scramble, Scramble, Who's Got Scramble?" by Charles E. Haley, City Traffic Engineer, Phoenix, Arizona. This paper summarizes the results of a survey conducted by the author during which questionnaires were sent to 212 cities and 152 answers received. The City of Boston, and in particular, the Boston Traffic Department, which has sole supervision of the installation, operation, and maintenance of traffic signals in this city, never received one of these questionnaires, and consequently, is not listed in the results of the survey.

We are very much interested in the "Scramble System," because Boston and all other cities and towns in Massachusetts have standardized on this type of pedestrian protection for over thirty years, as a result of the uniform code adopted by the Department of Public Works, Commonwealth of Massachusetts, which approves all signal installations.

The first exclusive pedestrian period, shown by red and yellow indications on all signals simultaneously, was included in the operation of the first traffic signal installed in Boston in December 1924, as attested by the attached newspaper clipping. Subsequent installations have almost without exception included exclusive pedestrian intervals, as indicated in the following statistics:

Total number of signalized intersections—317

Signalized intersections with exclusive pedestrian interval—303

Number of pedestrian intervals actuated by push buttons—229

Roadway widths vary from 20 feet to 100 feet

Since the sixty-four reporting cities use the "Scramble System" at a total of 452 intersections, it is obvious that 303 intersections in Boston, or 67 per cent of that total, would add considerably to the statistical data and conclusions of a survey of the "Scramble System."

Very truly yours,

TIMOTHY J. O'CONNOR
Commissioner
Boston Traffic Department

low initial cost
low erection cost
lowest maintenance cost

Here's a new all-aluminum sign developed especially for the large signs required on major expressways. The "Increment Sheet Sign" consists of aluminum increment sheets hung vertically on a supporting frame. It can be made in any height or width, and for ground or overhead installation. Each sheet engages with the adjacent sheet, providing a smooth-faced sign panel.

The advantages are obvious; new lows in the cost of material, installation and maintenance. The aluminum never needs painting or other costly maintenance. Erection is quick and easy. Reflective materials or painted backgrounds are available in any type letters or symbols. As for strength, the sign above, on New Jersey's Garden State Parkway, is designed to withstand wind in excess of 100 m.p.h.

Send today for new pamphlet with full engineering data.

ONE RESPONSIBILITY TOO

Through our associate company, Pfaff & Kendall, Tassco can offer a complete range of standards and supports for ground signs and overhead spans to meet any requirement.

TASSCO

TRAFFIC & STREET SIGN COMPANY
84 Foundry Street, Newark 5, N. J.

May 27, 1958

Dear Sir:

As you know, one of the problems which faces traffic engineers in all municipalities is the numerous requests for painting crosswalks. A related problem, at least in our town, is the many requests for mid-block pedestrian crossings, which must also be painted.

We have not been able to find any existing warrants used by traffic engineers to determine when they were justified in painting a particular crosswalk. Similarly we are looking for warrants for mid-block crossings.

Do you suppose that readers of TRAFFIC ENGINEERING magazine may have developed such warrants? If so, I would like very much to hear from them. Perhaps this is a subject for study by a technical committee.

YOSHIO KOSAI
Chief, Traffic Engineering Div.
Department of Public Works
Tacoma, Washington

Reference Notes

SUMMARY OF CITY TOWING EXPERIENCE

Based on Questionnaire Survey Conducted by Traffic and Transportation Division, City Engineer's Department, Minneapolis, Minnesota, April, 1958

1. CITY	2. TOW?	3. PRIVATE? PUBLIC?	4. FINE	5. TOW CHARGE	6. DO FINES HELP OR HINDER TOW PROGRAM?	7. ACTUAL EXPERIENCE OR YOUR BELIEF?	8. DOES HIGH FINE KEEP MOTORISTS FROM VIOLATING RESTRICTED ZONES?	9. TOWING NECESSARY TO ENFORCE FINE?	10. HOW HIGH SHOULD FINE BE?	11. HAVE YOU ABANDONED TOWING?	12. DO COURTS COOPERATE?	13. HOW IS POLICE COOPERATION?	14. ADDITIONAL STATEMENTS
Philadelphia (2,071,605)	Yes	Public	$3.00	$10.00, storage $3.00. $1.00 each day thereafter	Combined fine, towing charge & storage fee drastically reduces number of vehicles required to be towed.	Experience	Combined charges and inconvenience of vehicular recovery reduces number of violators.	Yes	Our combined fine, towing & storage fees of $16 satisfactory, currently.	Yes, the former "$6.00 Club" was abandoned several years ago due to politics & outside approvals.	Yes	Satisfactory, & due to combined charges & inconvenience involved, the number of vehicles towed has been a minimum.	Currently, tow-a-way areas are confined to three center-city streets with a total length of approximately 6 miles.
Toronto (1,117,470)	Yes	Public	Yes	$4.00, Storage charges $2.00 per day or part thereof.	Help	Experience. Rush hour fines are $10 for No Stopping area & $5 No Parking areas. When enforced this reduces number towed.	Yes, when enforced.	It is to some degree for some offenders.	$10.00	No, generally speaking our council realizes the need for stringent rush hour restrictions & has disregarded the merchant's complaints about rush hour prohibitions.	Yes	Good	Only one pound. Amount of towing limited, on high volume streets. Cars from downtown area impounded. Other areas towed to side streets - fine but no towing charge.
Washington, DC (802,178)	Yes	Public	Yes	No	Help	Belief	Yes	Yes	---	No	Yes	Excellent	Answers apply principally to rush hour prohibitions.
New Orleans (570,445)	Yes	Public	Yes	Yes	?	Belief	$2 for overtime parking & $3 for illegal parking. Fines too low for effectiveness.	Yes, The obedience, not fine.	$5.00 minimum	No	Yes	Good	
Seattle (467,591)	Yes	Private	Yes	Yes	Help	Belief	?	Yes	High enough to deter violation.	No	Yes	Very good	
Cincinnati (503,998)	Yes	Both	$6.00	$10.00	No opinion, towing fee is collected with parking tag.	Belief	Certainly has a deterrent effect.	Yes	Enough to discourage violations.	No	Yes	Police operate the program.	
Baltimore (949,708)	Yes	Public	$5.25	$5.00	Help	Experience	Yes, when fine was increased from $1.25 to $10.25, violations almost ceased.	No	$15 to $25	No	Yes	Excellent	In my opinion it is the impounding of the offending vehicles that makes the tow-a-way effective enforcement rather than either a "high fine" or a costly tow fee. The inconvenience of first locating the car, establishing ownership, and payment of costs before recovering car that is the real deterrent against repeated offenses. Actually just seeing the tow car cruising along the arterials with Rush Hour parking restrictions has minimized offenses locally.
Toledo (303,616)	Yes	Public	$3 to $7	$4, front. $5, rear.	No	Belief	No	Yes	?	No	Yes	Excellent	

New York (7,891,957)	Yes	Public	$15.00	$10.00 plus $1 service.	?	Belief	No	Yes	?	Cut back by budget problems.	Yes	Good	Towing, not fines, is answer in NYC.
San Francisco (775,375)	Yes	Private	Yes	Yes	Help	Experience	Yes	No	$15.00	No	Yes	Good	Detail places 19 policemen on the tow-a-way zones during towing periods. Each policeman met by one of 19 privately owned tow trucks under contract to Police Department. During normal day between 80 and 100 tickets issued for tow-a-way zone violations & 45 cars are towed away. Even though a large number of vehicles are not towed, threat of towing more effective than threat of ticket. There are many occasions where mere cost of fine and tow charge of, say $11 or more would be ignored rather than crowd a business deal. Inconvenience of retrieving towed car seldom ignored on purpose.
Pittsburgh (2,071,605)	Yes	Both	$2 to $10	$7.50 plus storage costs.	Fines have little effect on violator, towing very effective.	Experience	?	Yes	?	Towing used from 1947 to present date.	Is being improved	Good	Rush hour parking prohibitions best observed & best enforced parking regulations in city. This condition exists as most people realize that it is essential to keep streets clear for movement of traffic during peak periods, and drivers using these streets make every effort to prevent anyone from stopping or parking during these peak periods. Therefore, essential that good towing procedure be followed if rush hour parking prohibitions be respected.
Kansas City (456,622)	Yes	Private	$5.00	$7.50	?	Belief	Is only a partial deterrent	Definitely	$5 fine appears to be adequate	No	Yes	Good	
Dallas (434,462)	Yes	Public	$5.00	None	?	Belief	?	Our opinion is that the trouble of going to the pound for the car is a greater deterrent that the fine.	?	No	Yes	Excellent	We feel that the most important single factor in good observance of our parking regulations is certainty of punishment if rules are violated. There are a certain number of people in any city that are not impressed by fining. Great inconvenience is caused to anyone whose car is towed away, regardless of financial end of it, & this is easily as important as the fine charged. So far, all areas where vehicles can be removed by towing have been signed. These areas are those where the roadway is required for moving traffic during peak hours primarily.
Houston (596,163)	Yes	Private	$5.00	$10.00	?	?	Doubtful	No	$5 high enough	No	Yes	Private operation of towing causes delay, discourages police action.	
Detroit (1,849,588)	Yes	Both	$5.00	$5.00	No effect	Experience	Think so	No	Satisfied with $10 fee.	Policy has wide public acceptance, never been under pressure to abandon it.	Yes	The very best	City pays private towing companies ten cents per minute for service.
Chicago (3,620,962)	Yes	Public	$3 to $10	$10 passenger car, $30, truck	Towing necessary to enforce parking program.	---	Doubt if it would	Yes	?	No	Yes	Good	Used outside towing services. Complaints of abuses forced city into the business.
Denver (415,786)	Yes	Private	$10, tow-a-way area. $5, elsewhere.	$10	Help	Experience	$10 fine keeps violators at min.	Believe so.	$10 seems high enough.	No	Yes	Very good	
Milwaukee (637,392)	No	We have no towing provisions in Milwaukee at present time. From point of view of our department, and I believe the Police Department also shares this sentiment, it is regrettable that we are legally and otherwise unequipped to clear away violators during rush hours on our main thoroughfares or in full-time "No Parking" zones.											

Reference Notes

Adjustable Face Traffic Control Signal Head Standards

This is a revision of Technical Bulletin No. 1 of the Institute, approved as an American Standard on Nov. 26, 1951. The revision was developed by Technical Committee 7-A, and was approved as an Institute Standard by the Board of Direction on May 23, 1958. It is being submitted to ASA for approval as a revised standard.

Purpose

The purpose of this standard is to set up a guide to the preparation of purchase specifications for adjustable face traffic control signal heads.

Definitions

1. *Traffic Control Signals*—Any device whether manually, electrically or mechanically operated by which traffic is alternately directed to stop and permitted to proceed.

2. *Signal Head*—An assembly containing one or more signal faces which may be designated accordingly as one-way, two-way, etc.

3. *Signal Face*—That part of a signal head provided for controlling traffic in a single direction. Turning indications may be included in a signal head.

4. *Optical Unit*—An assembly of redirecting cover glass or lens, reflector, lamp and lamp socket with the necessary supporting parts to be used for providing a single signal indication.

5. *Lens*—That part of the optical unit which redirects the light coming directly from the lamp and its reflector.

6. *Signal Indications*—The illumination of a traffic signal lens or equivalent device or a combination of several lenses or equivalent devices at the same time.

Position of Signal Indications

All signal indications shall be in a straight line and shall be in the following order although all indications shown need not be included in all cases. In vertical signals, Position 1 shall be at the top, and Position 8 at the bottom. In horizontal signals, Position 1 shall be at the left (facing the signal), and Position 8 at the right:

Position	Signal Indication
1	Red
2	Yellow
3	Green
4	Straight Thru Arrow
5	Left Turn Arrow
6	Right Turn Arrow
7	Wait (or Don't Walk)
8	Walk

Note: It is desirable to mount the pedestrian signal indications either separately or below the conventional signal to allow for separate directional facing for these indications and to obtain definition of the signal by spacing.

Housing

1. The housing shall be made of a cast corrosion - resistant, non - ferrous metal, or approved superior alternate.

2. All cast metal parts shall have a tensile strength of not less than 17,000 pounds per square inch. All parts shall be clean, smooth, and free from flaws, cracks, blowholes and other imperfections.

3. If the housing, their doors, and/or cast visors of the signal heads are made of aluminum alloy, they shall have one of the following compositions:

a. If die castings be furnished, they shall be from the following specifications or the latest revision thereof:

Die Castings	ASTM-85-57T
SC 84A	SG-100B
SC 84B	S 12A
SG 100A	S 12B

b. If sand castings be furnished, they shall be of alloy S5A or alloy CS72A of ASTM specification B26-57T or the latest revision thereof.

c. If permanent mold castings be furnished, they shall be of alloy S5A or alloy CS72A of ASTM specifications B108-57T or the latest revision thereof.

4. When required, the successful bidder shall furnish satisfactory evidence that materials comply with foregoing requirements.

5. Housings shall be sectional.

a. A sectional housing shall consist of as many sections as there may be optical unit levels, together with a suitable top and bottom, all sections being rigidly and securely fastened together into one weather tight signal face or assembly.

6. Each housing shall be arranged with round openings in the top and bottom so that it may be rotated between waterproof supporting brackets or trunnions and thus be capable of being directed at any angle in the horizontal plane. The portion of the housing adjacent to the bracket shall be properly reinforced so as to have sufficient strength against breakage from shock.

7. The doors shall be suitably hinged and held securely to the body of the housing by simple corrosion resisting locking devices. All other door parts, such as hinge pins, lens clips, etc., shall also be of corrosion resisting material.

8. Weather - resisting, mildew - proof gasketing between the body of the housing and the doors, between the lenses and the doors, and between the lenses and reflectors shall be provided which shall exclude dust and moisture.

Visors

Each signal head shall have a visor for each signal indication. The visor shall be of sheet or cast construction as specified by the purchaser and shall be of corrosion-resistant, non-ferrous material. The visor shall be designed to fit tightly against the door and shall not permit any perceptible filtration of light between the door and the visor. The length of the visor and the percentage enclosure of the lens shall be as specified by the purchaser. The visor, if of sheet material, shall be not less than .05″ (No. 18 U.S. Gauge) in thickness.

Optical Unit

General—The optical unit consists of the lens, the reflector, the lamp and the lamp socket. The optical unit and visor shall be designed as a whole so as to eliminate the return of outside rays entering the unit from above the horizontal (known as sun phantom). The optical unit shall be so designed

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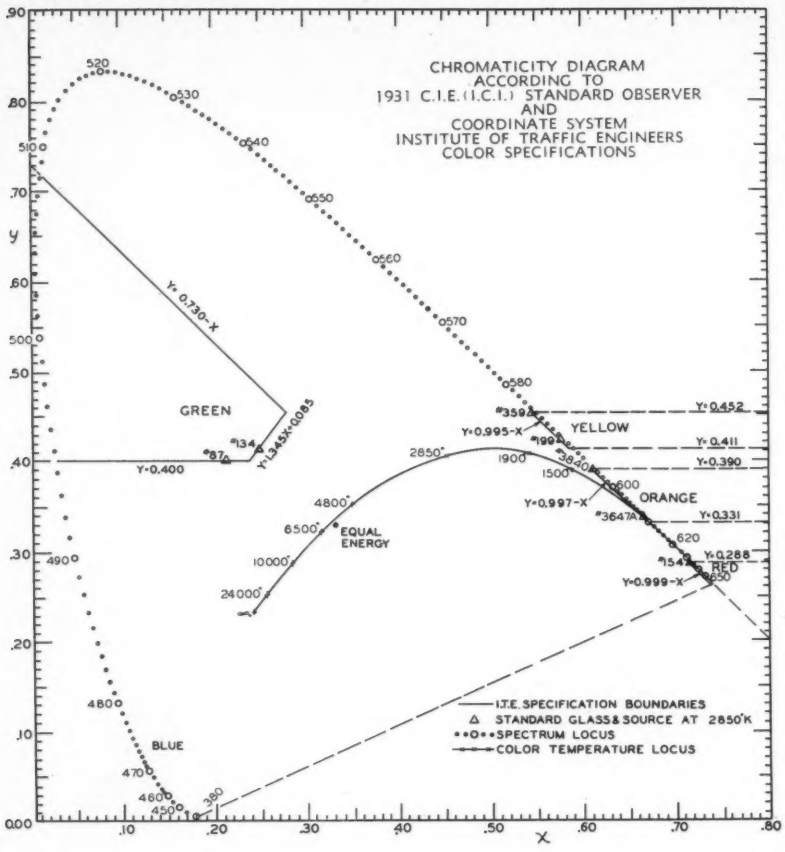

Figure 1

and assembled that no light can escape from one indication to another.

Traffic Signal Lenses
Part A

1. Purpose

a. The purpose of Part A of this specification is to define the minimum values of luminous transmission for traffic signal lenses and the limits of chromaticity for traffic signal colors by combinations of illuminant and redirecting cover glass or illuminant and standard limit glass.

2. Scope

a. The specification covers the so-called red, yellow, and green colors used in traffic signaling and the orange used for control of pedestrians.

3. Basis

a. The values given in the specifications were derived from spectrophotometric data obtained by the Colorimetry Section, National Bureau of Standards, with defining glasses selected by a technical committee of the Institute of Traffic Engineers. These values were computed on the following basis:

(1) Observer and coordinate system: C. I. E. Standards*

(2) Illuminant: C. I. E. Illuminant A

Planchian radiator at 2854°K. for values of x, y, and z and transmittance.

(3) Angular distribution of illumination: Approximately at right angles to the surface of the glass.

(4) Angle of view: Approximately at right angles to the surface of the glass.

b. The conditions just specified shall be used in testing glasses for conformity of Parts A and B of this specification, except that to test a lens for conformity to Part A a photometric procedure must be used similar to that indicated in Part C.

4. Explanatory

a. Any color can, in general, be adequately specified in terms of three colorimetric quantities. In the case of the signal colors the three quantities adequate for the purpose are two numbers defining the chromaticity of the color, i.e., its hue and saturation, and one number defining the luminous transmission of the glass. Since no two observers would, in general, get the same numbers by direct observation (because of differences in luminosity function and chroma vision) it is desirable to express such numbers in terms of an hypothetical average normal observer. Such an observer was defined by resolutions adopted at the 1931 meeting of the International Commission on Illumination at Cambridge (Proceedings pp. 19-29). The chromaticity of a color expressed in terms of this 1931 I. C. I. Standard observer is given by numbers x, y, z (called trichromatic coefficients or trilinear coordinates), which may be considered as expressing roughly the respective red, green, and blue contents of the color. Since the sum of x, y, z always equals unity, the chromaticity is adequately specified by giving any two of the numbers. See Fig. 1.

b. The chromaticity of all colors may therefore be represented graphically on a "mixture diagram" with values of y plotted against values of x. Permissible values of chromaticity for the signal colors are represented by certain areas on this diagram; the boundaries of these areas may be expressed as functions of y, and either x or z. These boundaries are placed so as to include the chromaticity obtained from the standard limit glasses when used with illuminants from 2854° K. to 2360°K.

5. Red

The luminous transmittance shall be not less than 0.047; the value of y shall not be greater than 0.288 nor less than 0.999—x.

6. Yellow

The luminous transmittance shall be not less than 0.440; the value of y shall not be less than 0.411 nor less than 0.995—x nor greater than 0.452.

7. Green

The luminous transmittance shall be not less than 0.200; the value of y shall not be less than 0.400 nor less than $1.345x + 0.085$ nor greater than $0.730—x$.

8. Orange—Pedestrian Control

The luminous transmittance shall be not less than 0.300; the value of y shall not be greater than 0.390 nor less than 0.331 nor less than 0.997—x.

(*) C.I.E., Commission Internationale d'Esclairage, formerly I.C.I., International Commission on Illumination.

Part B

1. Purpose

The purpose of Part B of this specification is to define the maximum deviations from the standard limit glasses, both in transmission and in chromaticity, to be permitted in glasses certified as duplicates of the standard limit glasses.

2. Transmittance of Limit Glasses

The luminous transmittance of certified duplicate limit glasses shall be within the limits shown in Table I, the illuminant being C. I. E. Illuminant A.

3. Chromaticity of Limit Glasses

All certified duplicate limit glasses shall pass Part A of this specification with respect to the trichromatic coefficients x, y and z; they must also pass the additional specifications of Table I. Table I gives the values of x and y for the standard limit glasses with the specified illuminant, followed by the maximum deviations from these values which are permitted in the certified duplicate glasses.

Part C

1. Purpose

The purpose of Part C of this specification is to provide for approved colored lenses for traffic signaling, to describe the materials and specify the appliances and appurtenances necessary to make the required tests and inspection.

2. Materials

Quality and processing shall be of the best for the purpose. The composition must be durable on prolonged exposure to weather; all lenses shall be uniformly colored, true to size and form, free from any streaks, wrinkles, chips or bubbles that in any way detract from their efficiency or use; flashed lenses will not be accepted.

3. Performance

a. The colored lens shall be so designed and manufactured that, when it is installed in a standard traffic signal (equipped with an approved lamp and reflector properly operated and focused), the resultant appearance, candlepower distribution and intensity, when compensated for absorption due to the color, will at least equal the light distribution required in this specification under "Candlepower Distribution."

b. In order to facilitate selection, manufacturer may submit to the purchaser samples for design approval. Any type that is so designed as to approximate these results may be approved by the purchaser if the individual lenses meet the color and transmittance requirements of this part of the specification.

4. Apparatus and Appurtenances for Testing

a. Certified Limit Glasses

Certified light and dark limit glasses calibrated by the National Bureau of Standards, Washington, D. C., shall be made available by the seller for use of the purchaser while conducting tests of traffic signal lenses at the manufacturer's plant. These certified glasses shall serve to define both the proper luminous transmissions of the lenses to be tested and the proper chromaticities of the resulting signal colors as hereinafter provided.

b. Photometer

A suitable photometer shall be made available at the lens manufacturer's plant by the seller for use of the purchaser while conducting tests. The illuminant used for measurements shall have a color temperature between 2360°K. and 3000°K., and with no samples in the beams the two halves of the photometric field shall have the same chromaticity.

NOTE:

Vacuum lamps or gas-filled lamps with bulbs should give the specified color temperature, and produce a uniform color and brightness over a uniform area.

5. Tests and Inspection

a. The glass manufacturer must place on each lens a label which shall indicate that the lens meets the requirements of this specification.

TABLE I

C.I.E. Coordinates of Primary Standards at National Bureau of Standards and Accuracy to be Observed in Preparing Certified Duplicates
C.I.E. Illuminant A, 2854°K.

Name of Standard and N. B. S. Serial No.	Chromaticity of Standard and Tolerance for Duplicate		Transmittance Range for Duplicate
	x	y	
Red, Yellow Limit #154	0.7132 ±0.0008	0.2867 ±0.0008	0.085 to 0.115
Red, Trans Std. #86	0.7224 ±0.0008	0.2776 ±0.0008	0.049 to 0.065
Yellow, Pale and Green Limit #359	0.5432 +0.0020	0.4517 −0.0020	0.677 to 0.763
Yellow, Red Limit #199	0.5762 −0.0020	0.4226 +0.0020	0.570 to 0.655
Green, Pale Limit #134	0.2448 −0.0024	0.4145 ±0.0024	0.252 to 0.285
Green, Blue Limit #87	0.2084 ±0.0012	0.4016 ±0.0024	0.188 to 0.213
Orange, Yellow Limit #3840A	0.6090 +0.0020	0.3900 −0.0020	0.470 to 0.540
Orange, Red Limit #3647A	0.6650 ±0.0015	0.3350 ±0.0015	0.290 to 0.330

TABLE II
Minimum Values of
Relative Luminous Transmittance

Color	Pressed Traffic Signal Lenses
Red	0.047
Yellow	0.440
Green	0.200
Orange	0.300

b. Chromaticity Test

The chromaticity of each lens shall be compared with that of the respective certified limit glasses, using for this purpose the above specified photometer and illuminant. The comparisons shall be made with brightnesses matched. A lens shall not be acceptable if its chromaticity fails to meet either of the following requirements:

1. The hue shall be not outside the hue limits given by the respective cer-

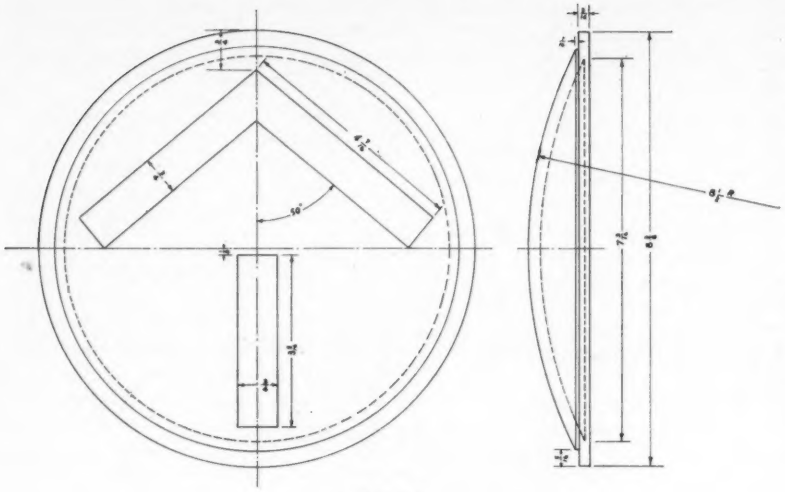

Figure 2

tified limit glasses, except that for red lenses only the yellow limit need be tested.

2. The saturation shall be not less than that given by the respective certified light limit glasses.

6. Marking

a. Certified Limit Glass Marking

Each certified limit glass (2″ square) shall be permanently engraved with the serial number by the maker, and further permanently engraved by the National Bureau of Standards with the serial number, the designation, the value of transmittance, the N. B. S. test number and the date.

NOTE:

In all cases the engravings may be verified, and additional information regarding the certified limit glasses obtained, from the N. B. S. Certificates for the glasses which shall be made available to the purchaser by the seller.

b. Each lens shall have pressed on its flange the word "TOP" to indicate the proper positioning of the lens in the door for obtaining the light distribution required, together with the diameter and other designations including the name or trademark of the manufacturer needed for proper application and help in purchasing replacements. If required by the purchaser, certification as to the conformance to these specifications shall be furnished by the manufacturer based on results of tests made by a neutral testing laboratory. The nominal eight-inch lens shall have an overall dimension of 8⅜″ and shall be circular with a visible diameter of not less than 7¾″.

7. Arrow Lens

For use in directing traffic moving in a certain direction during a specific interval, this specification provides for an arrow indication on a standard size traffic signal lens of the type shown on Fig. 2.

a. All lenses shall be prismatic diffusing or approved equal thereof.

b. The lens glass shall be of approved color conforming to previous sections of those standards for the particular function of the lens; namely, red, yellow or green.

c. All lenses shall be covered with a dull or dark grey enamel of a thickness sufficient to totally hide the light from a 150-watt lamp placed behind it. The enamel shall be baked or fired into the glass. The enamel shall be hard and durable and shall not peel or flake when subject to the heat of a signal lamp when the lens is in use nor when the lens is washed.

NOTE 1:

Tentative standards are being prepared for pedestrian signals. WALK-WAIT lenses will be covered in this standard.

NOTE 2:

The adoption of this standard specification does not preclude the design or use of other shaped or sized lenses for certain applications as it is felt that this latitude may result in constructive development of signal indications.

Reflectors

1. Reflectors may be mounted either (1) in the housing or (2) on the door.

2. When mounted in the housing, a reflector mounting is to be provided of non-corrosive material, so arranged that the reflector can be easily removed or swung out of the housing in order to maintain any necessary wiring.

3. When the reflector is mounted on the door, it shall be equipped with a holder or hinging device of non-corrosive material arranged for easy access for all maintenance and repairs.

4. In each case the method of mounting and fastening shall be sufficiently rigid to secure proper alignment between the lens and reflector when the door is closed.

5. The construction shall be such that the fit between the reflector and the lens will eliminate all possibility of false indications.

6. Glass reflectors shall be of one-piece best quality, clear glass, reasonably free from bubbles or ripples, with its back surface silvered by chemical deposition to such a thickness that the filament of a lighted 100-watt incandescent traffic signal lamp is invisible thru the silver layer.

7. The reflector shall have an opening in the back for the lamp socket.

8. The reflector backing shall consist of a homogeneous coating of metallic silver, evenly applied. It shall be so applied that no foreign substance remains between it and the glass, and it shall adhere so closely to the glass that the admission of any foreign substance—solid, liquid, or gas—shall be prevented.

9. Over the reflective backing there shall be applied electrolytically, a coat of metallic copper at least .0005″ thick at the minimum pont to reinforce and protect the silver from the admission of vapors or oxidizing agents prevalent in the atmosphere. The copper shall extend over the edge of the mirror at least one-fourth of the thickness of the glass.

10. If the weight of the copper backing is less than 1 oz. per reflector, there shall be placed over the backing one or more coats of paint or enamel of such quality as to render the greatest resistance possible to the admission of moisture or gases which might injure the copper or silver backing.

11. Tests and inspection:

The reflector shall meet the following test: The reflector shall first be immersed for twenty-four hours at room temperature in a solution composed of tap water and twenty per cent by weight of salt. It shall then be removed from the salt solution and rinsed in clear water, after which it shall be placed in clean water at room

(Continued on page 49)

EAGLE'S
new monotrol-radio traffic control system

Monotrol provides 60 traffic pattern changes a week—allows 31 functions, over existing 2-wire circuit. All automatically from one central point.

OFFERS MAXIMUM ECONOMIES — SIMPLICITY — FLEXIBILITY

- ★ Eagle Monotrol-Radio transmits a single pulsed tone signal at 2104 cycles. 56 standard tones are available.
- ★ Proven Monotrol with proven standardized radio equipment — easy to service. Provides 31 traffic functions.
- ★ Eagle Monotrol-Radio needs no interconnecting cable — a major economy feature of installation.
- ★ Applicable to Civil Defense.

Write for descriptive Bulletin. Address Dept. TE-858.

EAGLE

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Yearbook Changes

BATES, Russell G. (Associate)
Traffic Engineer, De Leuw, Cather & Company, 1256 Market Street, San Francisco 2, California. SEND MAIL: 19531 Royal Avenue, Hayward, California.

BOX, Paul C. (Junior)
Traffic Engineer, George W. Barton & Associates, 600 Davis Street, Evanston, Illinois. SEND MAIL: 4919 Louise Street, Skokie, Illinois.

CABRERA, Isaac T. (Associate)
Safety Expert, International Bureau of Labour, Geneva, Switzerland.

CLEES, Elmer A. (Associate)
Work Control Engineer, Washington State Highway Department, Transportation Building, Olympia, Washington. SEND MAIL: 3035 South First Street, Olympia, Washington.

COCHARO, Sam L. (Junior)
Traffic Engineer, Department of Public Works, City Hall, Pueblo, Colorado. SEND MAIL: 46 Amherst, Pueblo, Colo.

FISCHER, Stewart (Member)
City Traffic Engineer, P. O. Box 9066, San Antonio 4, Tex.

GALLOWAY, William G. (Junior)
Assistant Director, Division of Traffic, Kentucky Department of Highways, Frankfort, Kentucky.

INGRAM, William M. (Junior)
Planning Engineer, North Carolina State Highway Commission, Raleigh, North Carolina. SEND MAIL: 2407 Medway Drive, Raleigh, North Carolina.

JONES, Floyd I. (Junior)
Assistant Traffic Engineer, Room 501 City-County Building, 210 Monona Avenue, Madison 9, Wisconsin.

MARCONI, William (Junior)
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PECHT, George A. (Associate)
Coordinator—Civil & Structural Engineer, Ammann & Whitney, 1520 Connecticut Avenue, N.W., Washington 6, D.C. SEND MAIL: 409 Beaumont Street, Fairfax, Virginia.

SCHLEIDER, Robert H., Jr. (Junior)
Senior Designing Engineer, Texas Highway Department, 11th & Brazos Streets, Austin, Texas. SEND MAIL: 1309 Ridgemont, Austin, Texas.

SCOTT, Clyde W. (Junior)
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SHOAF, Ross T. (Member)
City Traffic Engineer, Department of Public Works, 460 McAllister Street, San Francisco 2, California.

TAMIR, Max M. (Associate)
President, Directomat, Inc., 510 Madison Avenue, New York 22, New York.

TAYLOR, Alonzo C. (Member)
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WALKER, E. L., Jr. (Junior)
City Traffic Engineer, High Point, North Carolina.

WOOD, Frank B. (Member)
Resident Engineer, N. Y. S. Department of Public Works, Upper North Avenue, Owego, New York. SEND MAIL: RD #2, Candor, Tioga County, New York.

Membership Applications

APPLICATIONS FOR TRANSFER

BARKER, John L.
Development Engineer, Automatic Signal Division, Regent Street, East Norwalk, Connecticut. June 16, 1958 for MEMBER grade.

BOSSI, Alfred A.
Traffic Engineer, City Hall, Las Vegas, Nevada. June 30, 1958 for ASSOCIATE grade.

BOX, Paul C.
Traffic Engineer, George W. Barton & Associates, 600 Davis Street, Evanston, Illinois. June 27, 1958 for ASSOCIATE grade.

BURTON, Francis C.
Traffic Engineer, P. O. Box 1293, Albuquerque, New Mexico. June 16, 1958 for MEMBER grade.

CHAFFEE, John L.
District Traffic Engineer, Washington Department of Highways, North 2820 Mayfair Street, Spokane, Washington. June 10, 1958 for ASSOCIATE grade.

DESJARDINS, Raymond J.
Director of Transportation Division, Metropolitan Toronto Planning Board, 133 Richmond Street West, Toronto, Ontario, Canada. June 13, 1958 for MEMBER grade.

DUNN, Robert E.
Assistant Traffic Engineer, Washington State Highway Commission, Transportation Building, Olympia, Washington. June 4, 1958 for MEMBER grade.

ELKOUBY, Joseph S.
Chief of Traffic Planning & Research, Direction of Public Roads, Ministry of Public Work, 244, Boulevard Saint-Germain, Paris (7e), France. July 7, 1958 for ASSOCIATE grade.

FLYNN, Earl H.
Traffic Engineer, Alfred Kaehrle Associates, 10 North Main Street, West Hartford, Connecticut. June 12, 1958 for MEMBER grade.

GALLOWAY, William G.
Assistant Director, Division of Traffic, Kentucky Department of Highways, Frankfort, Kentucky. July 2, 1958 for ASSOCIATE grade.

KAHOE, Edwin M., Jr.
Assistant to the President, Philadelphia Transportation Company, 200 West Wyoming Avenue, Philadelphia 40, Pennsylvania. June 17, 1958 for ASSOCIATE grade.

KELLY, Robert J.
Commissioner of Traffic Engineering & Parking, Room 400. 1404 East 9th Street, Cleveland 14, Ohio. June 18, 1958 for MEMBER grade

MURPHY, Charles J.
Director, Traffic Engineering & Safety Department, Automobile Club of New York—AAA, 28 East 78th Street, New York, New York. June 5, 1958 for MEMBER grade.

SHARP, J. Andrew
Assistant Traffic Engineer, 223 James Avenue, Winnipeg, Manitoba, Canada. June 13, 1958 for ASSOCIATE grade.

THOMPSON, James A.
Assistant Traffic Engineer, Missouri State Highway Department, Highway Building, Jefferson City, Missouri. July 7, 1958 for ASSOCIATE grade.

VANNICE, Robert E.
Engineer of Special Projects, Cuyahoga County Engineer's Office, 1900 Standard Oil Building, Cleveland 13, Ohio. June 11, 1958 for ASSOCIATE grade.

NEW APPLICATIONS

CALLAND, William B.
Associate Highway Engineer, California Division of Highways, P. O. Box 390, San Diego 12, California. June 10, 1958 for ASSOCIATE grade.

COCHRAN, George A.
Senior Traffic Analyst, Louisiana Department of Highways, Box 4245, Capitol Station, Baton Rouge, Louisiana. June 9, 1958 for JUNIOR grade.

GERN, Richard C.
Traffic Engineer, George W. Barton & Associates, 600 Davis Street, Evanston, Illinois. June 6, 1958 for JUNIOR grade.

GOODMAN, Leon
Traffic Engineer I, Port of New York Authority, 111 Eighth Avenue, New York 11, New York. June 23, 1958 for JUNIOR grade.

GRIGG, John L.
District & Traffic Engineer, Melbourne & Metropolitan Tramways Board, 616 Little Collins Street, Melbourne, Victoria, Australia. June 26, 1958 for JUNIOR grade.

HAMMOND, William L.
Manager, Traffic & Highways Department, Cleveland Automobile Club, 2605 Euclid Avenue, Cleveland 15, Ohio. June 9, 1958 for ASSOCIATE grade.

HIGGS, Robert W.
Inspecting Engineer, Trans Canada Highway, Department of Public Works, Hunter Building, Ottawa, Ontario, Canada. June 17, 1958 for ASSOCIATE grade.

JACKSON, Ann H.
Associate Highway Engineer, California Division of Highways, 150 Oak Street, San Francisco, California. June 23, 1958 for JUNIOR grade.

JOHNSON, Don H.
Traffic Engineer, City Hall, Victoria, Texas. June 16, 1958 for JUNIOR grade.

McCURDY, Bill L.
Assistant Traffic Engineer, Oklahoma Department of Highways, Capitol Office Building, Oklahoma City, Oklahoma. June 19, 1958 for JUNIOR grade.

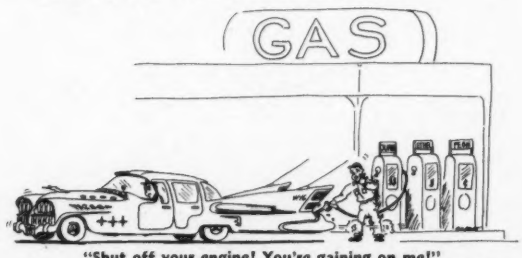
NINTZEL, Hans W.
Junior Civil Engineer, Department of Traffic, 100 Gold Street, New York 38, New York. July 3, 1958 for JUNIOR grade.

POMROY, Henry S.
District Traffic Engineer, Pennsylvania Department of Highways, 1140 Liberty Street, Franklin, Pennsylvania. July 7, 1958 for ASSOCIATE grade.

RYAN, James E.
Traffic Engineer, Charles A. Maguire & Associates, 100 Turks Head Building, Providence, Rhode Island. July 7, 1958 for ASSOCIATE grade.

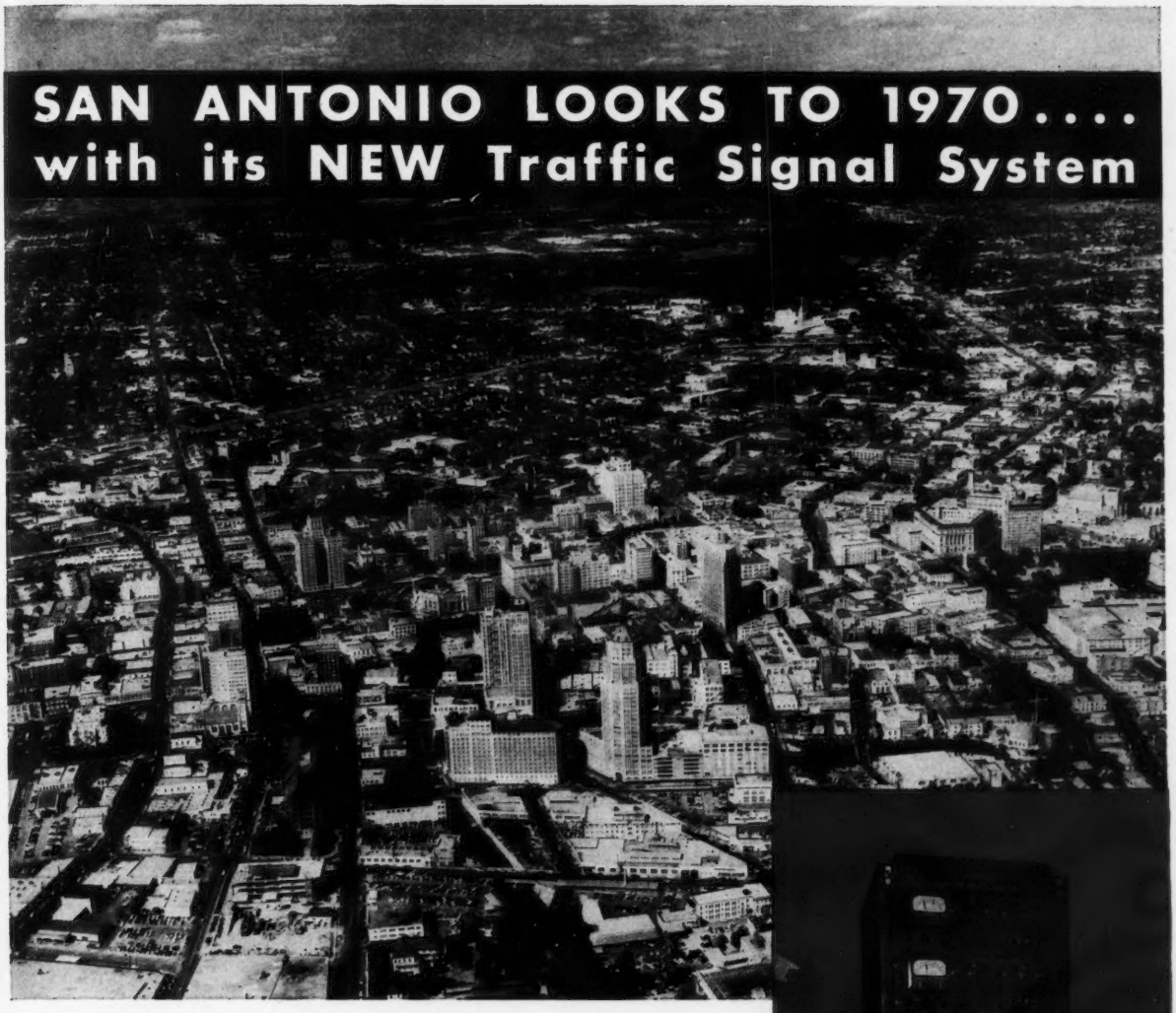
THOMPSON, Kenneth E.
Research Engineer, Municipality of Metropolitan Toronto, 171 Eglinton Avenue East, Toronto 12, Ontario, Canada. June 13, 1958 for JUNIOR grade.

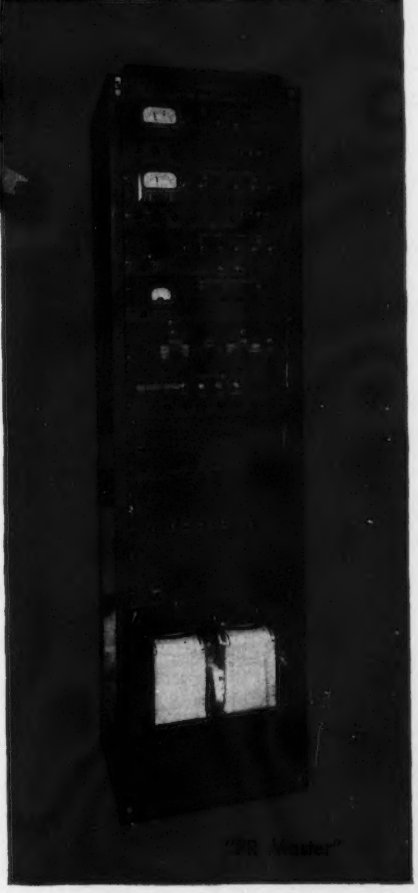
WILLIAMS, Jack F.
Traffic Engineer II, 120 North Howard Avenue, Glendale 6, California. June 17, 1958 for JUNIOR grade.



"Shut off your engine! You're gaining on me!"
—Cartoon by Gilbert

SAN ANTONIO LOOKS TO 1970.... with its NEW Traffic Signal System





153 intersections now controlled by ELECTRO-MATIC® PR SYSTEM

Handling today's traffic is difficult enough, but to provide signal controls for expected 1970 traffic volumes is a major accomplishment. San Antonio did just that. They selected a flexible, versatile system that not only puts an end to downtown traffic snarls but insures movement of maximum volumes in the years to come.

An ultramodern all-electronic "PR" System controls 153 intersections in the heart of vital, growing San Antonio. All changes in volume and direction of traffic are constantly recorded and the most effective signal indications automatically computed and put into effect smoothly and without delay.

For details on how the PR System can help your city grid or arterial traffic, write for Bulletin No. E-224.

"PR Local"

TRAFFIC ACTUATED

AUTOMATIC SIGNAL DIVISION
EASTERN INDUSTRIES, INC.
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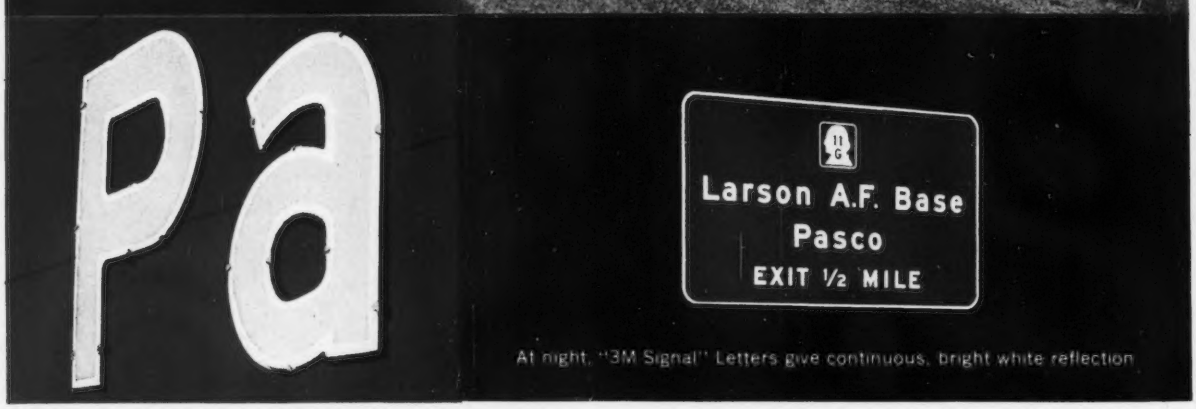
This completely reflectorized guide sign is 12 by 20 feet . . . on 12-inch aluminum extrusions.



At night, "3M Signal" Letters give continuous, bright white reflection

New "3M Signal" Letters come to Washington's Inland Empire

THE BOOMING GROWTH OF WASHINGTON STATE'S "INLAND EMPIRE" TOOK A BOLD LEAP FORWARD RECENTLY WHEN THE FIRST SECTION OF WASHINGTON'S 608 MILE INTERSTATE SYSTEM WAS OPENED NEAR MOSES LAKE. SYMBOLIC OF THE YEARS-AHEAD CHARACTER OF THIS MAGNIFICENT HIGHWAY ARE REFLECTORIZED GUIDE SIGNS MADE WITH NEW "3M SIGNAL" LETTERS THAT DIRECT MOTORISTS SURELY AND SAFELY DAY AND NIGHT.

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SCOTCHLITE
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REFLECTIVE SHEETING

MINNESOTA MINING AND MANUFACTURING COMPANY—where RESEARCH is the key to tomorrow

(Continued from page 44)

temperature. This bath with the reflector shall then be gradually heated in a temperature of 170° F. (76.5° C) and maintained at that temperature for four hours. After that heating, the reflector shall be removed from the water and placed in dry air at 170° F. (76.5° C) for four hours.

After the above test, the glass, silver, or the backing on the reflector shall show no chipping, cracking or softening of the coatings and shall show no separation of the backing into layers or from the mirror surface of the glass, and no appreciable change in the color of the glass, backing or the silver reflecting surface.

If required by the purchasers, certification as to conformance to these specifications shall be furnished by the manufacturer based on results of tests made by a neutral testing laboratory.

Reflectors (Alternate)

1. Traffic signal reflectors, instead of being made of silvered glass, may be made of specular Alzak aluminum, the thickness of the anodic coating to be a minimum of 0.0001 inches, or its equivalent, spun or punched from metal not less than .025 inches thick, equipped with a bead or flange on the outer edge to stiffen the reflector and insure its being held true to shape.

2. The reflecting surface shall be totally free of flaws, scratches, defacements or mechanical distortion.

Candlepower Distribution

1. Purpose. The purpose of this portion of the specification is to specify the required appearance, light distribution, and candlepower intensity from the lamp, reflector and lens combination of the complete signal indication.

2. Distribution Requirements.

a. The lighted signal shall appear to be illuminated over its entire surface without shadows when viewed from usual angles encountered in serv ice.

b. The resultant light distribution and candle-power intensity of the assembled traffic signal with colored lenses shall be not less than given on the candle-power chart (Fig. 3) when corrected for the absorption of the colored glassware (due to the colored material) coming within the transmission and chromaticity limits previously specified.

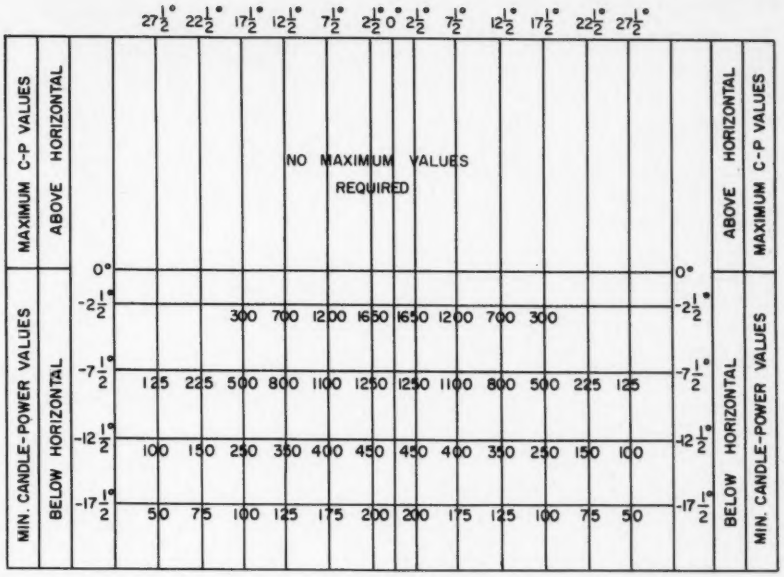


Figure 3

Candlepower Chart

The chart (Fig. 3) shows the required distribution of light from each traffic signal optical unit. Illuminant: 60-watt bulb burning at rated voltage with lument output approximately 665 lumens and color temperature approximately 2700°K. Test shall be made on the optical unit equipped with a clear lens with the lead-in wires up.

NOTE:

Above the horizontal, no maximum or minimum values are specified. All values shown on the chart are minimum candlepower values below the horizontal.

Lamps

Lamps to be used in traffic signal heads shall conform to the following standards:

Watts	Life Hours	Lumens
60-watt series	2000	665
	3000	665
	6000	665
120-watt series	2000	1260
	3000	1260
	6000	1260
150-watt series	2000	1950
	3000	1950
	6000	1950

Lamp Receptacle

The lamp receptacle shall be of heat resisting material designed to hold an A-21 bulb, 40, 60, 67 or 100-watt traffic signal lamp with the light center at the focal point of the reflector. This receptacle shall be provided with a lamp grip to prevent the lamp working loose, due to vibration. Provision shall be made on either the lamp receptacle or reflector holder to permit the proper focusing of lamps, and a secure fastening for the retention of the desired focus.

Wiring

Each lens receptacle shall be provided with two color coded #18 or larger rubber covered (or approved equal) lead wires conforming to ASTM specifications, securely fastened to the socket, and not less than two feet in length. When required by the purchaser, a suitable terminal block, for connection of the wires from the socket and the incoming wires to the traffic signal face, shall be provided in the signal housing.

Trunnions and Brackets

All trunnions, brackets and suspensions used for assembling and mounting traffic signal control faces are to be entirely weathertight. All arms shall be of not less than 1½" I.P.S. pipe (unless otherwise specified by the purchaser) to permit the traffic signal control wires or cable to be threaded through them.

Exterior Finish

All exterior parts of the signal heads excepting the lenses but including the mountings and assemblies, shall be finished with the best quality, synthetic resin enamel of the color specified by the purchaser.

PASSENGER ASSIGNMENT

(Continued from page 14)

curred in an area where some effect of centroids could be expected. For this reason, passengers are not entering the station at Davisville but at Eglinton, also, the number of passengers entering the station at Union Station is low, but at King Street is higher than the sample accounts for. The passengers predicted at each station represent the number of passengers using the rapid transit system in "normal" hours, "rush" hours and in total during a day.

Discounting the discrepancy in predicted and existing passenger volume at Union Station, the difference in per cent of the existing passenger volume is 1.5 per cent. The difference in per cent of the total passenger volume including Union Station is 9.8 per cent and lies within error limits. Thus, for the purpose of prediction the principles developed proved to be very satisfactory. Plate II compares the survey passenger volumes on the Yonge subway with the assigned volumes.

Output of the Assignment Program

1. Total daily passenger trips assigned to each assumed facility.
2. The number of passengers boarding and alighting at each rapid transit station.
3. The passenger volumes between each station on the line.
4. The origin and destination of trips in relation to the transit station of origin and destination used.
5. The time lost or saved by using the rapid transit system for all or part of the trip in preference to using surface transit for the entire trip.
6. The distance lost or saved by using the rapid transit system for all or part of the trip in preference to using surface transit for the entire trip.
7. The division of total trip length by distance on rapid transit and distance on surface transit.
8. The division of the above data by "rush" and "normal" travel periods of the day.
9. The summary of the number of passengers shown to use the rapid transit system by units of time and distance lost and/or saved.
10. Number of transfers made for each system for each O-D trip.

Analysis of the assignment results permits a detailed appraisal of each hypothetical rapid tranist system and a comparison of the system as follows:

1. The total passenger trips on each system by times of travel.
2. The distribution of trips on each line.
3. The comparison of trip length on rapid transit to total trip length.
4. The comparison of trip time on rapid transit to surface transit to total transit time.
5. The effect of a rapid transit system on existing surface lines and hence the possible savings on those lines resulting from rescheduling.

Positions Available

TRAFFIC & HIGHWAY ENGINEER

Position: Traffic and highway engineer with large civil engineering organization in Newark.
Requirements: Graduate civil engineer with traffic engineering and highway design or equivalent combination of specialized training. Experience not essential. Submit detailed resume of education, experience and references.
Apply: Box 73, c/o Institute of Traffic Engineers, 2029 K St., N.W., Washington, 6, D.C.

MINNESOTA HIGHWAY DEPT.

Position: Traffic engineers (three needed) to supervise installation and maintenance of traffic control devices, to make traffic surveys, and to study accident locations.
Requirements: Desirable qualifications include college graduation with a degree in CE, plus traffic engineering training and experience.
Salary: $6564 to $8004, with possibility of appointment above the minimum dependent on experience.
Apply: Civil Service Department, State of Minnesota, 122 State Office Building, St. Paul 1, Minnesota.

BALTIMORE COUNTY, MARYLAND

Position: Assistant Traffic Engineer for newly organized department in metropolitan county.
Requirements: Graduate engineer (preferred) with three year's traffic engineering experience.
Salary: $6,500 to $7,000 per year.
Apply: Walter J. Addison, Traffic Engineer, Baltimore County Department of Public Safety, County Office Building, Towson 4, Maryland.

COUNTY TRAFFIC SAFETY

(Continued from page 23)

000 you might be able to widen 25 others for the same amount and produce more safety?

29. Have you placed any "no passing" zones on any hills or curves? Are they needed?

30. Do you know that Purdue University has short courses in fundamentals of traffic engineering control which would be very valuable to your Highway Supervisor?

Practically all of these questions suggest what the correct answer should be. How did your county rate? This list alone shows how Indiana counties can improve the highway part of their traffic safety program. Your answers have no doubt proven to you that you have a long way to go. Until such time as a special survey reveals a more specific one—here is a program for you. I am sure that, like the rich young ruler, many of you will go away sorrowful because I have not shown you an easy royal road to traffic safety, but for those with the proper desire and determination to do something about it — HERE IS YOUR PROGRAM.

STRICTLY BUSINESS

(Continued from page 34)

U.S. Porcelain Originates Parking Lot Sign Series

In order to assist municipalities in their efforts to increase the use of off-street parking lots, U.S. Porcelain Enamel Company has designed a special program of signs for this purpose. Included are traffic directional, identification and on-lot control signs. Many of these vitreous porcelain on steel signs are carried in stock ready for immediate shipment in standard styles and sizes and a variety of colors. The company also offers the services of their art staff for designing specialized signs whenever needed.

The company for many years has supplied porcelain street name and traffic signs to municipalities, and U.S. Porcelain parking lot signs incorporate the safe "lifetime" porcelain finishes and vivid colors.

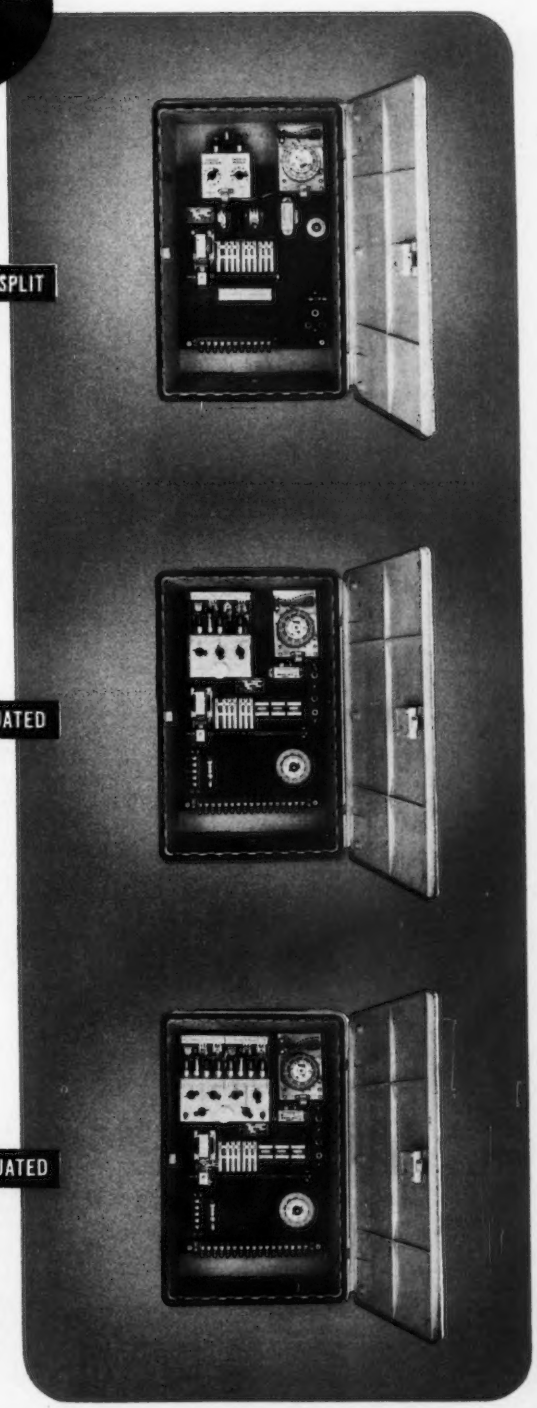
The company has just issued a new catalog containing its full line of porcelain parking lot signs, which is now available to municipal officials who wish to take advantage of the research done by the company in developing the complete "package." This new catalog can be obtained by writing U.S. Porcelain Enamel Company, 4731 East 52nd Drive, Los Angeles 22, Calif.

Hallock Opens New Office

Harold P. Hallock, formerly vice president of the Webb and Knapp Parking Corporation, has opened his own office at 420 Lexington Avenue, New York City, as president of the Minit Park Garage Company. Hallock, who is a Section Affiliate of the New York Metropolitan Section of ITE, is well known in the parking field, particularly in connection with mechanical parking systems.

MODEL 102V

AUTOFLOW



VEHICLE CONTROLLED SPLIT

MODEL 102V-CX Controller combines characteristics of both pretimed and actuated controllers. The cycle is continuous and synchronous. The program split is controlled by vehicle actuation. This permits complete coordination with progressive systems maintaining controlled rate and volume conditions in addition to providing a flexible Band Spread through direct vehicle control during EACH cycle.

SEMI-ACTUATED

MODEL 102V-S Controller provides continuous primary street movement with interruption for secondary street movement only by the presence of a vehicle on the secondary street. The control is responsive to all types of detectors and is capable of both actuated and pretimed operation. Pedestrian Extensions, coordinated operation and sequence variations are available in standard equipment.

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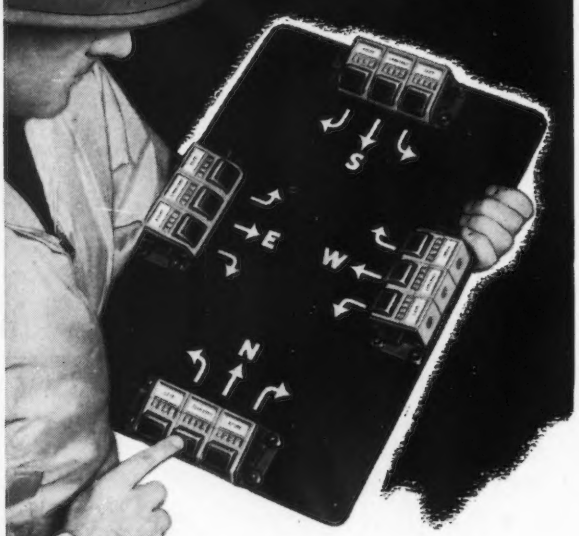

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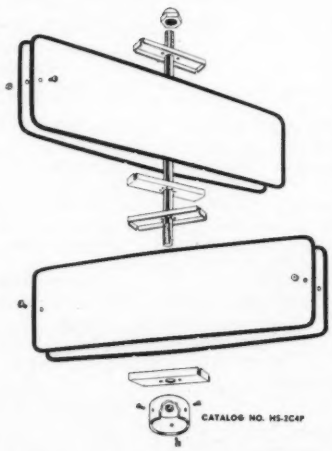

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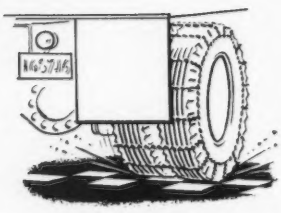

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